An Exploration of First-Generation College Graduate Health Outcomes in Early Adulthood

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Dedication

"Now, as a nation, we don't promise equal outcomes, but we were founded on the idea everybody should have an equal opportunity to succeed. No matter who you are, what you look like, where you come from, you can make it. That's an essential promise of America. Where you start should not determine where you end up."

– Barack Obama

The author wishes to dedicate this dissertation to those who dream and work tirelessly to achieve their greatest potential.

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Abstract of Dissertation

An Exploration of First-Generation College Graduate Health Outcomes in Early Adulthood

The purpose of this research was to explore the impact of first-generation college graduate status on health among college graduates in the United States. Chronic diseases and conditions such as heart disease, stroke, and obesity are among the most common, preventable illnesses in the U.S. Understanding the social and economic factors that influence individual and community health has become more important as growing evidence points to the effect of the interplay of the social, physical, health services, and structural environment on one's health. Education is increasingly recognized as an important social determinant of health, with parental education shown to be associated with educational and occupational outcomes in children. Almost one-third of the undergraduate population is first-generation college students - those whose parents did not earn a postsecondary degree; they are an important, growing, but often hidden population.

This research is a secondary analysis of a nationally representative sample of adolescents surveyed during the 1994-1995 academic year (WAVE I) as part of the National Longitudinal Study of Adolescent to Adult Health (Add Health). The sample was drawn from those followed-up in 2007–2008 (WAVE IV) when individuals were aged 24-32. Univariate, bivariate, and multivariate analytical methods, including mediation analysis were used to generate a profile of first-generation college graduates and to investigate the impact of that status on health (measured by Body Mass Index and blood pressure), and potential mediators of the relationship – health behaviors, stress and social support.

Approximately 44% of college graduates are first-generation and they were 1.6 times more likely to be from a minority group than their continuing generation peers (95% CI:1.27, 2.25) ($p = 0.000$). They were 3.91 times more likely to come from families with incomes below the median for college graduates ($51,000) than their peers (95% CI: 2.97, 5.15) ($p = 0.000$). First-generation college graduates had statistically significantly higher mean BMIs than their peers (28.41 and 26.62, respectively); first-generation college graduate status had a significant association to BMI, even while controlling individually for health behaviors, social support, and adolescent family income. Health behavior and social support did not mediate the relationship between first-generation college graduate status and health, but social support (received by, and provided to parents) differed significantly between first and continuing generation college graduates. For example, first-generation college graduates were 35% less likely to receive instrumental social support from parents or relatives.

Findings from this innovative research demonstrate the significance of first-generation college graduate status to health outcomes, expanding the limited extant literature on first-generation college graduate outcomes. Findings have implications for policies concerned with support of first-generation college graduates while in college, and in the transition into early adulthood. They support re-thinking requirements for the college admissions process, as results indicated disparities in adolescent family income, suggesting disadvantage in access and ability to persist in college. This is the first study, to the author's knowledge, to use a nationally representative dataset to generate a profile of first-generation college graduates and to explore health outcomes of first-generation college graduates in early adulthood.

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Chapter 1. Background

1A. Overview

Attaining a college degree does not simply have implications for one's opportunity in the job market, but has increasingly larger implications on one's health and well-being. The current research study examines the effects of first-generation college graduate status (derived from parental education) on health. It also examines the effects of potential mediators such as health behaviors, stress and social support on the relationship between first-generation college graduate status and health. Despite representing nearly a third of the national undergraduate population, first-generation college students - those whose parents did not earn a postsecondary degree - are an important but often hidden population (IHEP, 2012). They are not always easy to identify on campus or in the community at large because they are not a homogenous group in terms of race, ethnicity or culture. First-generation college students are more likely than their peers to be racial/ethnic minorities, financially independent, have dependents, and come from low-income backgrounds (Horn & Nuñez, 2000). Among the key findings on first-generation college students from thirty five years of trend data collected through the Cooperative Institutional Research Program (CIRP) Freshman Survey, was that a higher percentage of first-generation college students, as compared to their continuing generation peers, reported working more than 20 hours a week in their senior year of high school; they were also twice more likely to report having a major concern about financing college (Saenz, Hurtado, Barrera, Wolf & Yeung, 2007). While future earnings became a stronger motivation for all college students over the 35-year period of data collection, a larger percentage of first-generation students cited "being well off financially" as a very

important or essential personal goal (Saenz, Hurtado & Barrera, et al., 2007). This population of students is important to study because of the perception that, relative to their peers, these students have poorer academic preparation, different motivations for enrolling in college, varying levels of parental support, different expectations for their college experience, and significant obstacles in their journey to retention and succeeding academically (Saenz, Hurtado, & Barrera, et al., 2007). Underscoring the importance of studying this group of students that represents nearly one-third of the undergraduate population, this study profiles first-generation college graduates, students who have made it through the obstacles of their college experience, using a nationally representative set of data. It also seeks to understand potential similarities and differences in health by first-generation status among college graduates, and to understand the relationships between potential mediators of health and health. First-generation college graduate status (parental education) based broadly on the Ecological Model of Health, is expected to predict future outcomes such as educational achievement, occupational success and by extension, related to this study, positive health outcomes.

The overarching research questions of this study include: Are first-generation college graduates and continuing generation college graduates similarly matched in terms of health (BMI and blood pressure)? How do health behaviors, stress and social support potentially mediate the relationship between first-generation college graduate status and health? There is limited extant literature on first-generation college graduate outcomes, specifically health outcomes. This innovative study is the first, to the author's knowledge, to use a nationally representative dataset to generate a profile of first-generation college graduates, and to explore their health outcomes in early adulthood. The findings of this

study fill the dearth of limited literature on first-generation college graduate outcomes and potentially identify social and health disparities in a large and growing population for which there is a limited set of data.

1B. Study Aims

The aims of the current study include the following:

1) Descriptive Aim: Describe the demographic profile of first-generation college graduates in early adulthood and compare to continuing generation college graduates.
2) Examine health by college graduate generation status.
3) Examine potential mediators of health by college graduate generation status.
4) Assess the relationships between health behaviors, stress, social support and health (BMI & blood pressure).
5) Determine if health behaviors, stress and social support (individually), mediate the relationship between first-generation college graduate status and health.

1C. Significance of Study

1C1. Education as a Social Determinant of Health

The significance of social determinants to health has been recognized on a national level by the U.S. Department of Health and Human Services. The latest iteration of Healthy People, a list of science-based objectives and benchmarks for improvement of the nation's health status added "Social Determinants of Health" to the *Healthy People* 2020 Topics. *Healthy People* has been in existence for over 30 years and is updated every 10 years. Five key determinants including education were highlighted; the other four were economic stability, social and community context, health and health care, and

neighborhood and built environment (see Figure 1.1 below) (U.S. Department of Health and Human Services, 2016). A recent study documented the relationship between education and health by using data from the National Health Interview Survey and matching respondents to the National Death Index. The study found that individuals with higher education levels were less likely to die within 5 years of being interviewed. Moreover, the authors found that the association between education and health remained significant even after controlling for job characteristics - occupation and industry, family income (low vs. higher income: <$20,000 and >$20,000) and family background (Cutler & Lleras-Muney, 2006). The findings from that analysis suggest that education is indeed the most critical of acquired social statuses (among them, occupational status, earnings, personal and household income and wealth) and substantially influences those statuses (Mirowsky & Ross, 2003). In this sense, policies to increase educational attainment for individuals have the potential to improve health outcomes for the nation, through education's cumulative and self-amplifying positive effects on aspects of life.

Figure 1.1. Healthy People 2020, Social Determinants of Health

1C2. Health and Education Policy Implications

The findings of the current study have implications for national policies concerning college recruitment and attainment of first-generation college students, as well as college policies and programs related to social support and resources for the transition to post-college life. According to the existing literature on education and health, policies that increase educational attainment could help improve health outcomes by decreasing prevalence of chronic illness. By exploring college generation status as a new mechanism through which education affects health, the study is of public health significance, as the findings identify first-generation college graduate status as a factor relevant to health. This is the first study, to the author's knowledge, to use a nationally representative dataset to generate a profile of first-generation college graduates and explore the health outcomes of first-generation college graduates in early adulthood.

1C3. Organization of the Dissertation

Chapter 1 presents the introduction, aims and significance of the study and the contributions and limitations of the study. Chapter 2 is a review of the literature pertaining to chronic disease prevalence, education and health, parental education and health, the first-generation college student population, the theoretical model and conceptual framework, research questions and hypotheses guiding this study. Chapter 3 presents methodology including the study design, population, sampling and data analysis procedures. Chapter 4 presents the findings of the study. Chapter 5 summarizes the findings and discusses the research, practice, and policy implications of the study. References and appendices are included at the end of the dissertation.

Chapter 2. Literature Review

This chapter presents a review of the current literature related to chronic disease prevalence, education and health, parental education and health and the first-generation college graduate population. This literature review ends with research questions based on the background information provided. The research study is approached in the context of the Ecological Model of Health which suggests that multiple levels of influence beyond just an individual's own attitudes, knowledge and behaviors have an impact on that individuals health (McLeroy, Bibeau, Steckler & Glanz, 1988).

2A. Overview: Statement of the Problem – Chronic Disease & Health Behavior

Chronic diseases and conditions such as heart disease, stroke and obesity are among some of the most common, costly, and preventable illnesses prevalent in the United States. About one half of adults, aged 18 and over (117 million people) have at least one chronic condition according to estimates generated from the 2012 National Health Interview Survey (NHIS) (Ward, Schiller, & Goodman, 2014). Two of the top five leading causes of death are heart disease and cerebrovascular diseases (stroke) (Murphy, Xu, Kochanek, & others, 2012). The health indicators associated with these diseases – Body Mass Index (BMI) and blood pressure are the outcomes of focus for this dissertation, as they are risk factors associated with heart and cerebrovascular disease.

Seven of the top ten leading causes of death are chronic illnesses or diseases; health risk behaviors and lifestyle contribute to the majority of these types of illnesses (Ford, Croft, Posner, Goodman, & Giles, 2013). Four modifiable risk behaviors contribute to much of the prevalence of chronic illness that plagues adults—lack of exercise or physical activity, poor nutrition, tobacco use, and excessive alcohol use.

2A1. Prevalence of Chronic Illness

This section presents a summary of the current literature related to chronic disease prevalence. Some of the results of uncontrolled BMI and blood pressure, health outcomes of interest for the current study, are high blood pressure and obesity. It is important to understand the prevalence and consequences of uncontrolled BMI and blood pressure to understand the significance of maintaining normal levels of these important health indicators.

2A1a. High Blood Pressure & Stroke

Blood pressure is measured as systolic and diastolic pressures; 'systolic' is the pressure of blood against the arteries of the body when the heart beats while pumping blood and 'diastolic' refers to blood pressure when the heart is at rest between beats (NHLBI, NIH, 2015). Because it encompasses two measurements, blood pressure is written as two numbers and when an individual has a measurement of 120/80 mmHg most of the time, their blood pressure is considered normal. Hypertension, or high blood pressure is when one's blood pressure is 140/90 mmHg or above, most of the time. High blood pressure usually has no symptoms and is discovered upon visiting a doctor or having it checked regularly in some other capacity. Many factors can affect blood pressure, but the following factors put individuals at higher risk for having high blood pressure: older age, being African American, obesity, being stressed or anxious often, drinking too much alcohol (>1 drink per day for women and > 2 drinks per day for men), eating too much salt, having a family history of high blood pressure, having diabetes and smoking (Mayo Clinic, 2014). Most people can help prevent high blood pressure by following lifestyle changes designed to bring blood pressure down and/or maintain it at a

normal level (Board, 2014). Uncontrolled high blood pressure is one of the main risk factors for stroke.

Almost one-third of American adults (29%) have high blood pressure and a little over half (52%) of people with high blood pressure have their condition under control (Nwankwo, Yoon, Burt, & Gu, 2013). Prehypertension, when blood pressure numbers are higher than normal, but not yet in the high blood pressure range exists in 1 in every 3 adults in the U.S (Go, Mozaffarian, & Roger VL, et al., 2013). High blood pressure prevalence increases with age, with women being about as likely as men to develop high blood pressure during their lifetimes, from decade to decade (see Table 2.1 below).

Age	Men (%)	Women (%)
20-34	11.1	6.8
35-44	25.1	19.0
45-54	37.1	35.2
55-64	54.0	53.3
65-74	64.0	69.3
75 and older	66.7	78.5
All	34.1	32.7

Table 2.1. High Blood Pressure Prevalence and Age (CDC, 2014)

High blood pressure prevalence varies by race and ethnicity. Blacks develop high blood pressure at an earlier age, than Whites and Hispanics (CDC, 2014). Blacks also develop high blood pressure more often than Whites and Hispanics. In addition, more Black women than men have high blood pressure (Go, Mozaffarian, & Roger VL, et al., 2013) (see Table 2.2 below).

Race or Ethnic Group	Men (%)	Women (%)
African Americans	43.0	45.7
Mexican Americans	27.8	28.9
Whites	33.9	31.3
All	34.1	32.7

Table 2.2. High Blood Pressure Prevalence and Race (CDC, 2014)

Blood pressure matters because more than 348,000 American deaths in 2009 included high blood pressure as a primary or contributing cause (Mozzafarian, Benjamin & Go et al., 2015). High blood pressure increases an individual's risk for dangerous health conditions including first heart attack and chronic heart failure, with 7 of every 10 people having their first heart attack also having high blood pressure; the same prevalence applies to chronic heart failure. Risk of first stroke is also elevated with high blood pressure with about 8 of every 10 people having their first stroke also having high blood pressure (Mozzafarian, Benjamin & Go et al., 2015). Cardiovascular and cerebrovascular disease risk factors are the main health focus of this dissertation, but high blood pressure is also a major risk factor for kidney disease.

As part of the CDC Health Disparities and Inequalities Report, a supplement on coronary heart disease and stroke deaths was included. This report noted that stroke was the underlying cause of death for 137,119 persons with an age-adjusted mortality rate of 43.6 per 100,000 standard population (Keenan & Shaw, 2011). The report also demonstrated that rates for Blacks were 32.3% higher than rates for Whites (61.6 versus 41.7 per 100,000 population, respectively). Similarly, for coronary heart disease (CHD) deaths, Blacks had higher age-adjusted rates than the other racial/ethnic groups including Whites, American Indian/Alaskan Native, Asian/Pacific Islander and Hispanics (Keenan & Shaw, 2011).

2A1b. Obesity

Obesity is a highly preventable condition that has become a serious public health issue, with more than one third of adults classified as obese (defined as having a body mass index, BMI, of ≥30 kg/m2). According to the most recent national data, the prevalence of adult obesity was 35.7% overall, 35.5% among adult men and 35.8% among adult women; 17% of youth were categorized as obese. Non-Hispanic adult Blacks have the highest age-adjusted rates of obesity (47.8%), followed by Hispanics (42.5%), non-Hispanic Whites (32.6%), and non-Hispanic Asians (10.8%) (Ogden, Carroll, Kit, & Flegal, 2014). There are significant racial and ethnic disparities in obesity prevalence among U.S. adults aged 20 and over (Ogden & Carroll, 2010). For example, while the prevalence of obesity increased for men and women over 20 years old in all racial and ethnic groups from 1998 to 2008, among women in 2007–2008, non-Hispanic Black women (49.6%) were significantly more likely to be obese than non-Hispanic White women (33.0%) (Ogden & Carroll, 2010). Mexican-American women (45.1%) were also more likely to be obese than non-Hispanic White women (33.0%). Very similar disparities existed in 1988–1994 (22.9% of non-Hispanic White women, 38.3% of non-Hispanic Black women, and 35.3% of Mexican-American women were obese), demonstrating that much hasn't change in terms of reducing or eliminating this health disparity (Ogden & Carroll, 2010).

2A2. Public Health and Economic Consequences

Transcending the individual level, high blood pressure and obesity have economic consequences as medical costs associated with both involve direct and indirect costs in terms of actual receipt of health care services and daily workplace productivity. It is

estimated that high blood pressure costs the nation $47.5 billion each year, covering the cost of health care services, medications to treat high blood pressure and missed days of work (Heidenreich, Trogdon & Khavjou, et al., 2011). Similarly, it is estimated that the medical care costs of obesity in the United States are a staggering $147 billion to $210 billion (Finkelstein, Trogdon, Cohen, & Dietz, 2009);(Cawley & Meyerhoefer, 2012).

2B. Education and Health

The definition of 'socioeconomic status'(SES) has traditionally included education, income, and occupation (Adler & Newman, 2002). Of these three characteristics, education is probably the most basic socio-economic status component since it helps to develop future career/occupational options and earnings potential (Adler & Newman, 2002). Education is also critical because it helps to provide knowledge and life skills that allow for more access to information and resources that ultimately promote health (Ross & Wu, 1995). Employment status, occupations, occupational status and work, measures often used by social scientists when describing productive activities, characterize the links between education and health.

The topic of education-related health inequities is somewhat controversial, with researchers coming to different conclusions on the extent to which education affects health. This is in part due to the misconception that is it only financial resources such as money that count in terms of social status and health (Mirowsky & Ross, 2003). While economic well-being does form a major link between education and health, the link is more dynamic, including ability and effectiveness. It is ability and effectiveness gained through increased education that encourage economic well-being, which positively influences health (Mirowsky & Ross, 2003). Also in question, is whether there is a causal

or correlational relationship between education and health. These differences in views on the extent to which education affects health are largely related to data limitations including multiple confounders at play that influence health, and to measured health outcomes often being self-reported.

The interrelationships between demographic and family background, effects of poor health in childhood, greater resources associated with higher levels of education and a learned appreciation for the importance of good health behaviors are some of the complex ways in which education affects health (Telfair & Shelton, 2012). Several mechanisms are proposed to explain how education affects health including income and access to health care, labor market, value of the future, information and cognitive skills, preferences, rank and social networks (Cutler & Lleras-Muney, 2006). The health returns to education suggest that public policy should do more to promote educational attainment and will be discussed in the review that follows (Cutler & Lleras-Muney, 2006).

2B1. Education and Skills, Behaviors, Wealth and Resources

Zimmerman and Woolf recently discussed the many ways in which education impacts several aspects of life such as skills, behaviors, wealth and resources and how these in turn affect health (Zimmerman & Woolf, 2014). For example, education affects one's ability to navigate health information: Cutler and Lleras-Muney (2010) report that increased cognitive ability resulting from education contributes significantly to the education gradient in health behaviors. Decisions around certain health behaviors impact one's life – i.e. effect of smoking on health, effect of diet on health and effect of other lifestyle behaviors on health.

While specific mechanisms linking SES to health have changed over time, SES remains a fundamental social cause of disease because it involves access to resources and social supports that can be used to avoid risks or minimize consequences of disease (Link & Phelan, 1995). Higher SES can also be used to engage in more health-promoting behaviors because of this increased access to resources and supports. Economic vulnerability stemming from limited occupational opportunities can affect health through a cascade effect on the ability to acquire resources that are important to health: food, stable housing, transportation, insurance, and health care (Braveman, Egerter, & Mockenhaupt, 2011). Lastly, educational attainment is highly related to stress and allostatic load (a measure of stress hormones, blood pressure, and body mass index). Individuals with lower levels of educational attainment are at greater risk of exposure to stress, such as chronic occupational stress or unemployment, and may be less likely to have buffers that reduce the impact of stress (social support, sense of control over life, and high self-esteem) (Thoits, 2010). Chronic stress and increased levels of cortisol can damage the brain through long-term changes in structure and function. Neuroscientists at the University of California, Berkeley found that chronic stress generates more myelin-producing cells and reduces neurons (Chetty et al., 2014). This results in excess myelin (white matter), in some areas of the brain, causing disruptions in balance and timing of communication in the brain. The excessive sheathing can hijack the fight-or-flight system and backfire in a daily life in which individuals are not in physical danger (Bergland, 2014). The scientists studied the hippocampus, the part of the brain that regulates memory and emotions and, in essence, demonstrated how chronic stress can predispose the brain to mental, learning and memory problems.

In fact, moving one step backward in the developmental process from adulthood to childhood, individuals who grew up in poverty as children may already start out at a biological disadvantage in terms of the effects of new stress they experience as adults. A study looking at youth of working poor African Americans in Georgia evaluated poverty-related risks of the students at age 11-13. Students who had been evaluated as performing well emotionally, academically, and socially by their teachers had a high allostatic load at age 19 (Brody, Yu, Chen, Miller & Kogan, et al., 2013). While these students are likely viewed as "resilient," for overcoming adversity, they may be suffering physiologically. These success-oriented students may be at a greater risk, later in life for chronic diseases such as high blood pressure and heart disease, irrespective of the chronic stress they may face as adults.

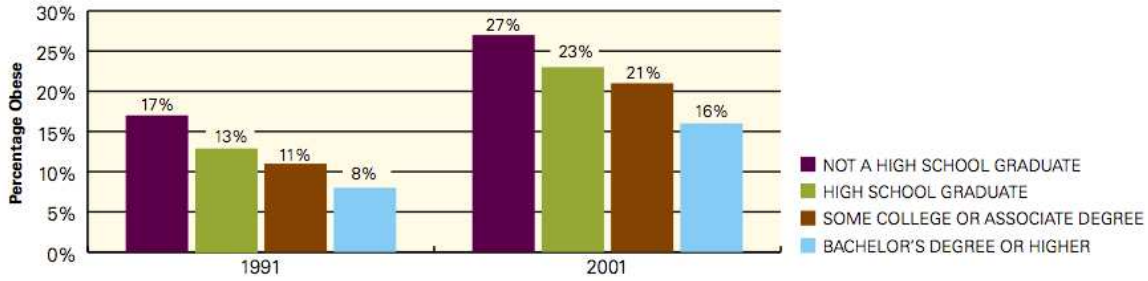
2B2. Educational Attainment, Life Expectancy and Chronic Illness

There are well-documented associations between educational attainment and health. For example, the age-adjusted mortality rate of high school dropouts aged 25 – 64 was more than twice that of those with some college (Adler & Newman, 2002). The relationship between education and health appears across countries - as average education increases, life expectancy improves, although the returns to life expectancy appear to be larger for poorer countries (Cutler & Lleras-Muney, 2006). In addition, the same is true within countries, with the more educated populations being more likely to live longer (Cutler & Lleras-Muney, 2006). Using data from the National Health Interview Survey, researchers found that those with more years of formal education report having lower morbidity from the most common acute and chronic diseases (heart condition, stroke, hypertension, cholesterol, emphysema, diabetes, asthma attacks and ulcer) (Cutler &

Lleras-Muney, 2006). They also found that the magnitude of the relationship between education and health varies across conditions, but are consistently significant with an additional four years of education lowering five-year mortality by 1.8% (relative to a base of 11%) and reducing the risk of heart disease by 2.16% (relative to a base of 31%) (Cutler & Lleras-Muney, 2006). The reasons for the associations are multi-pronged but are likely attributed to differences in behavior across education groups. The authors found that those with more years of schooling (4 years beyond 12) were less likely to smoke (11% relative to 23%), less likely to drink heavily (7 fewer days of 5 or more drinks in a year, among those who drink, with a base of 11 days), less likely to be overweight or obese (5% lower obesity, compared to an average of 23%), less likely to use illegal drugs (0.6% relative to an average of 5%) (Cutler & Lleras-Muney, 2006). Important to note, the health behaviors only explained some (30%), but not all of the difference in health outcomes (Cutler & Lleras-Muney, 2006).

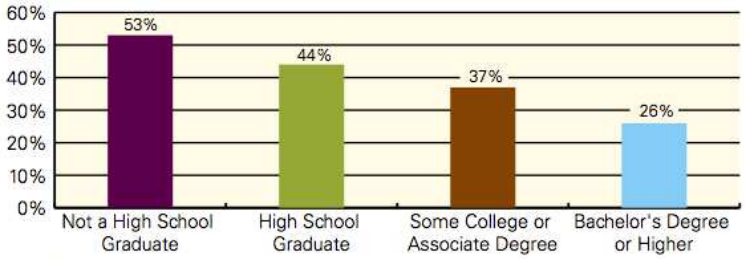
Underscoring the importance of education to health, one study examined education, income, and occupation in relation to risk factors for cardiovascular disease and when taken together, only education remained as a significant predictor (Wrinkleby, Jatulis, & Frank, 1992). The two graphs below (Figure 2.1), adopted from the *Education Pays*, Trends in Higher Education Series from the College Board, demonstrate how obesity has increased over a decade, but more importantly, how its relationship to educational attainment has remained the same, with obesity decreasing as education level increases. The percent of adults suffering from two or more risk factors for heart disease increases with decreasing educational levels (Baum and Payea, 2005).

Figure 5d: Obesity in Adults Age 20 and Older in the United States by Education Level, 1991 and 2001



Source: CDC, 2001, Table 5.

Figure 5e: Multiple Risk Factors for Heart Disease: Percentage with Two or More High-Risk Factors by Education Level, 2003



Note: Adults with two or more of the following: high blood pressure, high cholesterol, diabetes, obesity, current smoking, or physical inactivity.
Source: CDC, 2004b.

Figure 2.1. Obesity and Chronic Disease in Adults by Educational Level (Baum and Payea, 2005)

2B3. Parental Education

The link between education and health is well established, but the degree to which other social statuses impact this association is less clear. At the most basic level, parents' education indirectly affects children's outcomes, for example, academic achievement, through the impact of both parents' education and family income on where a family can live and the types of jobs the parents are likely to have (Eccles, 2005). Several studies have demonstrated that parental education is a social status factor that has the potential to be associated with outcomes in children. Parental education is a significant predictive factor in determining college enrollment and degree completion for students of all racial and ethnic backgrounds (Terenzini, Springer, & Yaeger, et al., 1996). Results of a study on the effects of parents' education on children's educational and occupational success

indicated that the beneficial effects of parental educational level when a child is young (age 8) were not limited to academic achievement throughout school years, but had long-term implications for positive outcomes that carried over into middle adulthood (i.e., higher educational level, more prestigious occupations) (Dubow, Boxer, & Huesmann, 2009). Data for this study was analyzed from the Columbia County Longitudinal Study on children that lived in Columbia County, NY starting in 1960, with a total of four surveys over 40 years. The entire sample of third graders participated in the first wave of the study; over 90% of the original sample (n=856) was Caucasian, almost half were female and half were male and came from a broad range of socioeconomic backgrounds. In wave four of the study, data on 80% (683) of the original participants was collected with 61% (523) being interviewed extensively. This re-sample had a mean age of 48.85 years old, and an average educational level between some college and a college degree, and an average occupational attainment reflecting middle-class status according to an occupational coding system (Dubow et al., 2009). In this study, parents' education was defined by the average of two parents' (if two were interviewed) educational attainment on a 7-point scale ranging from 1 to 7, with 1 being 'some high school' and 7 being a 'doctorate or law degree.' This study demonstrates how parent's education could have an impact on children well beyond childhood years and suggests the need to further research the mechanism through which parental education has an effect on longer-term outcomes - relevant to the aims of the current study.

A study focused on a low-income, ethnically diverse group of parents indicated support for a family economic stress model that hypothesized how economic hardship influenced child well-being through its negative impact on parents' psychological well-

being and less than optimal parenting behavior (Mistry, Vandewater, Huston, & McLoyd, 2002). This study demonstrated the impact of parental factors related to SES on children's outcomes such as a child's well-being. In this vein, maternal education was found to be the strongest predictor (in a composite of SES that included household income and welfare receipt) of preschool children's cognitive and behavioral outcomes (Mistry, Biesanz, Chien, Howes, & Benner, 2008).

Another study examined the process of how socioeconomic status (parents' education and income) indirectly relates to children's academic achievement through parents' beliefs and behaviors (Davis-Kean, 2005). The sample consisted of a nationally representative sample of 868 8-12 year olds distributed equally between both gender and non-Hispanic White and African American background; the data was collected from a national, cross-sectional study. Using structural equation modeling, the author found that the socioeconomic factors were related indirectly to children's academic achievement through parents' beliefs and behaviors. In addition, parents' years of schooling was found to be an important socioeconomic factor when looking at the children (Davis-Kean, 2005).

Many parents may be determined to have their child succeed, but may often neither have the knowledge or experience to adequately help the student (Miller, 2008). This is particularly important when you take into consideration that family encouragement and support in both students' pre-college and college experiences emerged as one of the most important influences upon first-generation degree attainment, in a qualitative case study of first-generation college graduates (Mahan, 2010). Researchers have suggested that differences between first-generation college students and

their continuing generation peers with more highly educated parents, were of "sufficient clarity" that one might even hypothesize the possibility of different models of success in college for first-generation students (Pascarella, Pierson, Wolniak, & Terenzini, 2004). Moving beyond college, parental education has been described in terms of its effect on first-generation college graduates' experience transitioning from college into the workforce (Olson, 2014). For example, findings from an analysis of data from the U.S. National Longitudinal Survey of Young Men (NLSYM) suggest that two people with the same level of education enter the labor market with similar wages and wages rise more rapidly for those with better-educated parents (Hudson & Sessions, 2011). In this sense, parental education appears to gives new labor market entrants a head start that potentially continues at higher levels of experience; it is not entirely clear why this is the case. This differential impact of parental education on life outcomes of children in adulthood indicates the need to understand other potential ways in which parental education affects children in adulthood, for example, health outcomes, and possible mechanisms to explain the differences. Figure 2.2 below demonstrates the theoretical model for understanding how parents' educational attainment impacts children's health in adulthood.

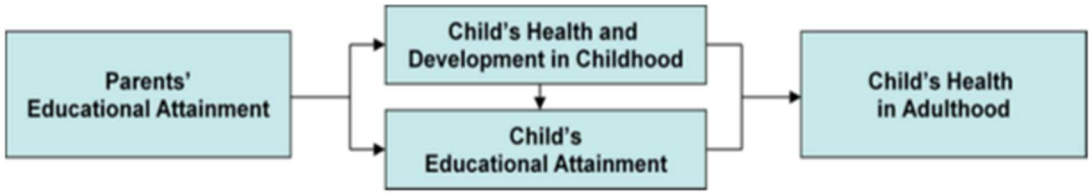


Figure 2.2. The Impact of Education on Health Across Generations (Egerter, Braveman & Sadegh-Nobari, et al., 2009).

2B4. Parental Education and Health Outcomes

Ross and Mirowsky attempted to understand parental education's impact on health outcomes by assessing whether or not individuals from families with parents that

have more years of formal education have better health outcomes than those from families with parents that have less years of formal education. According to the theory of resource substitution, the beneficial effect of education on health is greater for those with fewer alternative resources (Mirowsky & Ross, 2003). In this sense, resource substitution theory hypothesizes more health benefits from personal education for people whose parents have lower education than for those whose parents are more educated. This theory has several important health implications in general and for those who are the first children in their family to attain a college degree (first-generation college graduates; to be further characterized in the next section). Following with the theory, if an individual's parents were poorly educated, higher levels of personal education can potentially overcome the health disadvantages associated with the family background (Ross & Mirowsky, 2011). Also, because one's own level of educational attainment is highly defined by that of one's parents, individuals from family backgrounds with less educational attainment are likely to be poorly educated themselves; this type of resource substitution is called structural amplification (Ross & Mirowsky, 2011; Mirowsky & Ross, 2003). The study used data from the 1995 survey of Aging, Status, and Sense of Control (ASOC), a national telephone probability sample of United States households, with follow-up interviews in 1998 and 2001. The study defined health as physical impairment and found that as the less educated age, the negative health effects of their parents' low educational attainment get worse (Ross & Mirowsky, 2011). In this sense, those individuals who have less education, and came from families with low educational attainment are at a double disadvantage in terms of health outcomes as they age.

Several international studies have shown that childhood socio-economic

disadvantage is associated with an elevated rate of adult cardiovascular disease (CVD) events and have spurred investigation as to the underlying mechanisms (Kvaavik, Glymour, Klepp, Tell, & Batty, 2012). Some explanations as noted earlier, include that childhood poverty influences later CVD via established risk factors or that childhood deprivation is linked to an increased prevalence of future smoking, raised blood pressure, elevated blood cholesterol, physical inactivity and obesity (Kvaavik et al., 2012). Researchers examining CVD in adulthood using the longitudinal Oslo Youth Study suggested that comparing the importance of mother's educational attainment to father's helps in understanding the mechanisms through which childhood disadvantage affects adult CVD risk (Kvaavik et al., 2012). For example, in the context of Europe, the authors discuss how until recently, fathers had a substantially greater influence on material circumstances in two-parent families, while mothers may have more influence on behavioral norms or dietary patterns. As a result, the long term effects of paternal education may be primarily mediated by the adult individual's own education, while mother's education may trigger behavioral pathways less closely associated with the individual's own attained education (Kvaavik et al., 2012). The authors mention there is some evidence that maternal psychological and physiological factors relate more strongly to the characteristics of their children than do those of the father; some prior studies report mother–child correlations for body mass index (BMI), blood pressure and blood lipids, to be stronger than comparable father–child correlations, although it is not a consistent observation (Kvaavik et al., 2012). Similar to research efforts in the U.S., remarkably few prior studies have explicitly examined both mother's and father's socio-economic status (SES) as predictors of adult CVD risk, which is the main focus of the

current study. Looking at parents' educational status in relation to CVD risk factors for their future adult children may give insight into important mechanisms linking childhood disadvantage and adult CVD risk.

2C. First-Generation College Students

Surprising to some, only approximately 34% of the adult population aged 25-29 in the United States has completed college or higher level of education. Within this portion of college degree-holders, there are disparities in college degree attainment by race/ethnicity and gender (U.S. Department of Education, NCES, 2015). For example, among those between the ages of 25 to 29 years old, just 22% of African Americans and 15% of Hispanics (any race) hold a college degree compared to 41% of Whites in the same age group (U.S. Department of Education, NCES, 2015).

A significant portion of college students are first-generation college students, or students whose parents did not earn a postsecondary degree and they comprise nearly a third of the national undergraduate population (IHEP, 2012). The growing interest in first-generation college students stems from our nation's belief in the promise of opportunity. To the extent that access and success in higher education can be increased, and opportunities for improved life circumstances can be increased, first-generation college students are an important group to study.

There is a dearth of nationally representative data on first-generation college students and even less information on first-generation college graduates. A statistical analysis report from the National Center for Education Statistics, 1989–90 Beginning Postsecondary Students Longitudinal Study, provides a descriptive snapshot of first-generation college students. The sample was limited to students who enrolled in

postsecondary education for the first time during the 1989–90 academic year; the cohort was followed-up in 1992 and 1994, with the 1994 follow-up offering information regarding student persistence and degree attainment five years after the students initially enrolled in postsecondary education. Among the findings, which were tested for significance among comparisons: first-generation students were more likely to be older, have lower incomes, be married, and have dependents than their non-first-generation peers (U.S. Department of Education, Nunez, & Cuccaro-Alamin, 1998). They were more likely to enroll in postsecondary education part-time, and to attend public 2-year institutions; private, for-profit institutions; and other less-than-4-year institutions than their non-first-generation counterparts. First-generation students were equally as likely to be taking remedial classes as non-first-generation students when they began their postsecondary education, but there were differences by type of school attended for this measure. For example, at private, not-for-profit 4-year institutions, first-generation students were more likely to be taking remedial courses than their counterparts, meanwhile, the proportions of first-generation and non-first-generation students at public 4-year and public 2-year institutions taking remedial coursework did not differ significantly (U.S. Department of Education et al., 1998). First-generation students were more likely than non-first-generation students to say that being "very well off financially" and "providing their children with better opportunities than they had" were very important (U.S. Department of Education et al., 1998). They were more likely to say that obtaining the amount of financial aid needed, being able to complete coursework on a faster timeline, to live at home, and to work while attending the school were very important influences in their decision to attend their selected postsecondary institution

(U.S. Department of Education et al., 1998). First-generation students persist in postsecondary education, but attain credentials at lower rates than their non-first-generation counterparts and this held for students at 4-year institutions and public 2-year institutions (U.S. Department of Education et al., 1998). Based on these descriptive characteristics, first-generation college students appear to be at a disadvantage in terms of increased responsibility as compared to their peers, but are ambitious in terms of their desire to complete college and resourceful in terms of means to get it done.

In terms of actually earning a degree, if first-generation students attained bachelor's or associate's degrees, they earned comparable salaries and were employed in similar occupations as their non-first-generation peers (Horn & Zahn, 2001). In fact, the 2015 American Freshman Survey, an annual report of approximately153,000 full-time, first-year students at 227 four-year public and private institutions showed that the advanced-degree aspirations of first-generation students are rising: in 1974, 41.9% of first-generation students said they hoped to earn a master's or doctorate degree and now, nearly 75% of first-generation freshmen say they hope to earn an advanced degree, only 3% behind other students (Eagan, Stolzenberg, Ramirez & Aragon, et al., 2014). Importantly, particularly for the current study, even when controlling for many of the characteristics that distinguished them from their peers, such as socioeconomic status, institution type, and attendance status, first-generation student status continued to have a negative effect on persistence and attainment of a college degree (U.S. Department of Education et al., 1998).

A more current report on the profile of first-generation college students by the Cooperative Institutional Research Program (CIRP) at the University of California, LA

had many similar findings to the NCES report. The report was based on 35 years of survey data collected through the CIRP's Freshman Survey from 1971 to 2005 (Saenz, Hurtado, & Barrera, et al., 2007). Among the key findings for demographic characteristics - the proportion of first-generation students within the overall population of first-time, full-time entering college freshman at four-year institutions steadily declined since 1971, perhaps reflecting increasing levels of education among the U.S. population in general (Saenz, Hurtado, & Barrera, et al., 2007). Differences between racial/ethnic groups exist, however. Since 1975, African Americans showed the greatest decline in representation of first-generation college students, a rate declining faster than the relative proportion of African American adults without a college education, as well as faster than the decline of first-generation students in other racial/ethnic groups (Saenz, Hurtado, & Barrera, et al., 2007). Hispanics remained the least educated group (69.1% of adults without a college education in 2005), but had the highest proportion of first-generation college students (38.2%) at four-year colleges of any racial/ethnic group (Saenz, Hurtado, & Barrera, et al., 2007).

In terms of parental engagement, first-generation college students are more likely than their peers with college-educated parents, to report that the reason why they went to college was because their parents wanted them to go, contrary to the idea that parents' wishes are a deterrent to college-going wishes of first-generation college students (Saenz, Hurtado, & Barrera, et al., 2007). While both groups' reports of parental encouragement increased, the trend has more than doubled for first-generation college students since 1971, versus their peers with college-educated parents (Saenz, Hurtado, & Barrera, et al., 2007). In terms of financial considerations, and similar to the NCES report, financial

considerations, including future earnings, have become a much stronger motivation for all students attending college over the last 35 years, but in particular, first-generation students were more likely to report "being well off financially" as a very important or essential personal goal (81% vs. 73%) (Saenz, Hurtado, & Barrera, et al., 2007). This finding is in line with previous findings and is not too surprising considering their typically low socioeconomic status. Higher percentages of first-generation college students, than their peers worked 20 or more hours per week in their final year of high school, and 55% expected to get a job to pay for college expenses - a gap that widened between these students and their peers since 1987 (Saenz, Hurtado, & Barrera, et al., 2007).

The forces working against first-generation college students - financial barriers, the types of schools they are more likely to attend, the fact that they are more likely to need to have gainful employment during their studies, often manifests in their lowered graduation rates (IHEP, 2012). A 2011 Higher Education Research Institute study highlighted several important findings regarding first-generation college students (DeAngelo, Franke & Hurtado et al., 2011):

- 42% of students whose parents attended college graduated within 4 years while only 27% of first-generation students graduated within 4 years
- Nearly 60% of students whose parents attended college graduated within 5 years, less than 45% of first-generation students graduated in the same time frame
- While 64 % of students whose parents attended college graduated within 6 years, only 50% of first-generation students earned their degrees in that time frame

While first-generation students make up a greater proportion of the student body at U.S. colleges and universities, they are not necessarily keeping up this increased pace in terms of graduation rates. Until we understand the barriers for those who want to earn a degree, while maintaining other responsibilities, the number of students with some college education, but no degree to show for it, will continue to be a challenge for higher education.

A postsecondary degree has become increasingly necessary for social and financial stability and success. In turn, the benefits of a college degree are particularly relevant for historically underserved students, such as first-generation, low-income, and racial/ethnic minority students, given America's commitment to economic and social mobility (IHEP, 2012).

Institutions are facing pressure to increase graduation rates from various stakeholders. Public institutions are facing pressure from state legislations while private institutions are facing pressure from regional accrediting bodies. Nationally published ranking of schools also put pressure on the schools as graduation rates are now incorporated into these ranking systems. In the *American Graduation Initiative*, President Obama set the goal for America to have the highest proportion of college graduates in the world by 2020 (www.whitehouse.gov). In order to accomplish this goal, institutions must evaluate strategies to help increase retention and graduation rates of the student body. They must also make greater efforts to create conditions for success for all students that begin college (DeAngelo, Franke & Hurtado et al., 2011).

Retention and attrition issues are significant for the first-generation college student population and are among the main areas of focus for research on first-generation

college students. For example, at 4-year institutions first-generation students are twice as likely as students whose parents had a bachelor's degree, to leave before their second year (23% vs. 10 %); even when taking into account factors associated with not returning, such as delaying enrollment after high school or working full-time, financial aid, gender, race/ethnicity, etc., first-generation status remained a significant indicator of a student leaving before their second year (U.S. Department of Education, 2001). Retention and attrition issues are significant, but are beyond the scope of focus for the current study, which aims to tackle the less researched area of first-generation college graduates and their outcomes once they have overcome the hurdle of completing college and moved into adulthood. Little has been written about first-generation students after they leave formal higher education, regardless of whether or not they completed a degree (Olson, 2014). The priority has most likely been placed on understanding the factors that impact retention and persistence of these students, given the relatively low graduation rates of first-generation students (24% attaining a baccalaureate degree, compared to 68% of non-first-generation students (Olson, 2014). Some limited attention is now being given to the post-college experiences of first-generation students (Huber, 2010; Mahan, 2010; Olson, 2010).

2D. Theory/Conceptual Model and Related Constructs

The review of literature regarding chronic illness prevalence, health behavior, the effect of education on health, and of parental education on health, required a broad and inclusive model from which to try to understand health among first-generation college graduates. The theoretical model used to guide the current study is the Ecological Model of Health, which refers to the interrelations between organisms and their environments

(McLeroy, Bibeau, Steckler & Glanz, 1988). The Ecological Model of Health derives from Urie Bronfenbrenner's Ecological Framework for Human Development and applies socio-ecological models to human development. In his initial theory, Bronfenbrenner postulated that in order to understand human development, the entire ecological system in which growth occurs needs to be taken into consideration (Bronfenbrenner, 1979). Ecological models, as they have evolved in behavioral sciences and public health, focus on the nature of individual's transactions with their physical and sociocultural surroundings. This study takes a closer look at the effects of interpersonal level and individual level factors on health with first-generation college graduate status perhaps serving as both an individual and interpersonal level of influence on health. The Ecological Model of Health is used as a guiding theoretical basis through which to try to understand how the effect of first-generation status and selected social factors and behaviors, based on previous research on importance to health, may impact health as measured by BMI and blood pressure (see Figure 2.3 for theoretical model). A conceptual model for the current study was developed based on the levels of the Ecological Model of Health, specifically the interactions that take place in the individual and interpersonal layers (see Figure 2.4 for the conceptual model). The conceptual model was also developed to parallel a mediation analysis, with health as the main outcome of interest and health behaviors such as physical activity, fast food consumption sugar-sweetened beverage consumption and smoking representing individual behaviors, stress representing individual attitude and social support received from, and provided to parents, representing the interpersonal level of interactions that affect health. Hypotheses

were developed in conjunction with the conceptual model and directionality of hypotheses guided by previous research mentioned in the literature review.

Theoretical Model – Ecological Model of Health

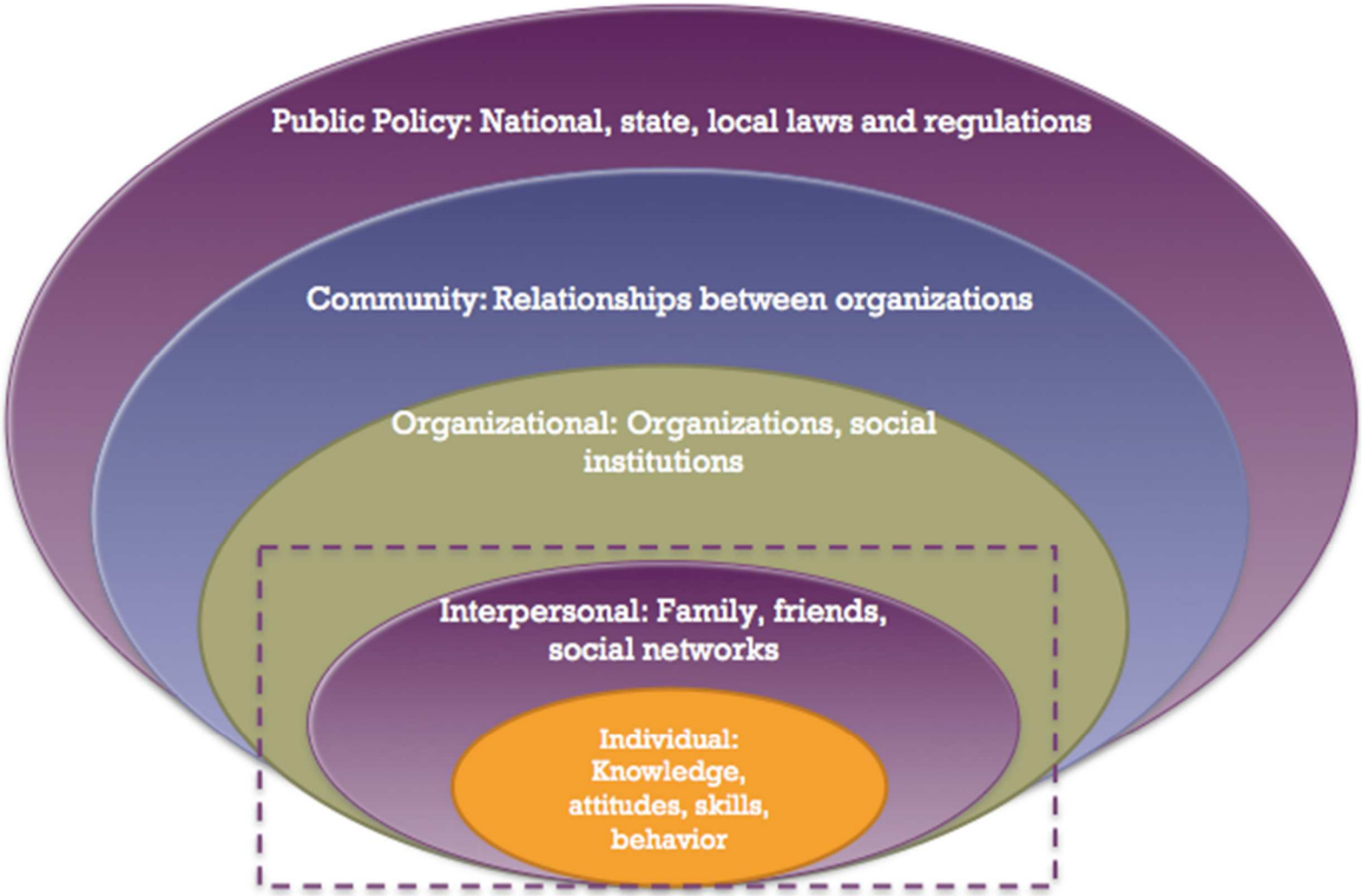


Figure 2.3. Ecological Model of Health (McLeroy, Bibeau, Steckler & Glanz, 1988)

Conceptual Model

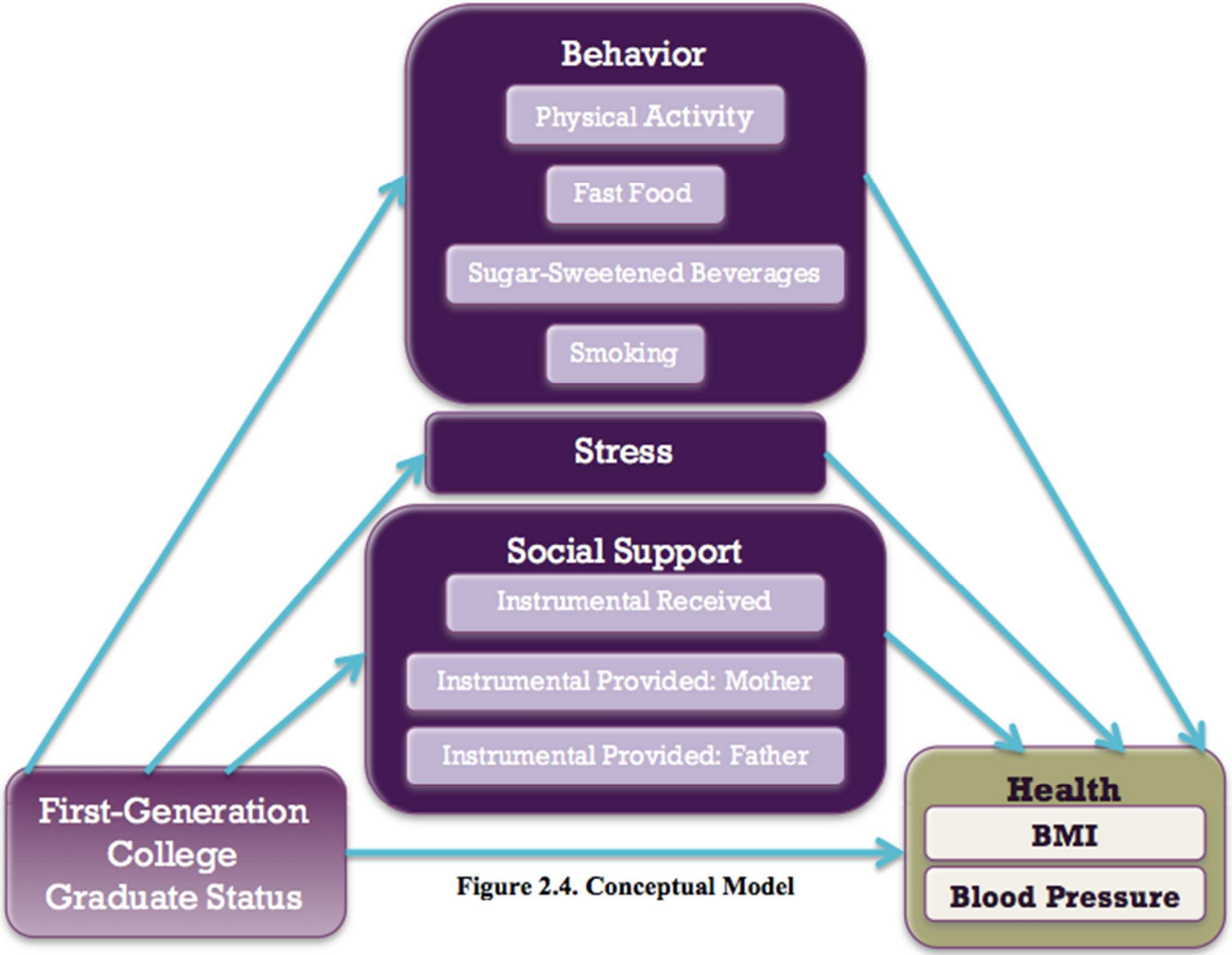


Figure 2.4. Conceptual Model

2E. Research Questions and Hypotheses

Based on the aforementioned conceptual model and presented theoretical model, this study will use an existing nationally representative cohort of young adults (first surveyed in adolescence), to answer the following descriptive aims and research questions related to first-generation status and health, first-generation status and potential mediators, potential mediators and health, and first-generation status and health controlling for potential mediators.

2E1. Descriptive Aims

1) What is the socio-demographic profile of college graduates overall in early adulthood?

2) What is the socio-demographic profile of college graduates stratified by college graduate status in early adulthood?

Hypotheses: These are not applicable since these are descriptive aims.

2E2. Direct Relationship Between First-Generation Status and Health

Research Question 1: Does health (as measured by BMI and blood pressure) differ by first-generation status among college graduates?

Hypothesis 1a: First-generation college status will be associated with increased BMI among college graduates.

Hypothesis 1b: First-generation college status will be associated with increased likelihood of prehypertension/hypertension.

2E3. Potential Mediators and Relationship to First-Generation Status

Research Question 2: Do health behaviors, stress and social support differ by first-generation status among college graduates?

Hypothesis 2a1: Participation in physical activity will differ by first-generation college graduate status among college graduates.

Hypothesis 2a2: Fast food consumption will differ by first-generation college graduate status among college graduates.

Hypothesis 2a3: Sugar-sweetened beverage consumption will differ by first-generation college graduate status among college graduates.

Hypothesis 2a4: Smoking will not differ by first-generation status among college graduates.

Hypothesis 2b: First-generation status will be associated with higher reported stress.

Hypothesis 2c1: First-generation status will be significantly associated with lower likelihood of receipt of instrumental family support among college graduates.

Hypothesis 2c2: First-generation status will be associated with higher likelihood of provision of instrumental support to a mother/mother figure among college graduates.

Hypothesis 2c3: First-generation status will be associated with higher likelihood of provision of instrumental support to a father/father figure among college graduates.

2E4. Relationship between Potential Mediators and Health

Research Question 3: Does health (BMI & blood pressure) differ by health behaviors, stress and social support?

Hypothesis 3a1: Higher participation in physical activity will be associated with lower BMI.

Hypothesis 3a2: Higher physical activity will be associated with lower blood pressure.

Hypothesis 3a3: Higher fast food consumption will be associated with higher BMI.

Hypothesis 3a4: Higher fast food consumption will be associated with higher blood pressure.

Hypothesis 3a5: Higher sugar-sweetened beverage consumption will be associated with higher BMI.

Hypothesis 3a6: Higher sugar-sweetened beverage consumption will be associated with higher blood pressure.

Hypothesis 3a7: History of smoking will be associated with higher BMI.

Hypothesis 3a8: History of smoking will be associated with higher blood pressure.

Hypothesis 3b1: Higher stress will be associated with higher BMI.

Hypothesis 3b2: Higher stress will be associated with higher blood pressure.

Hypothesis 3c1: Receipt of social support will be associated with lower BMI.

Hypothesis 3c2: Receipt of social support will be associated with lower blood pressure.

Hypothesis 3c3: Provision of social support to mother/mother figure will be associated with higher BMI.

Hypothesis 3c4: Provision of social support to mother/mother figure will be associated with higher blood pressure.

Hypothesis 3c5: Provision of social support to father/father figure will be associated with higher BMI.

Hypothesis 3c6: Provision of social support to father/father figure will be associated with lower blood pressure.

2E5. Relationship between First-Generation Status and Health while Controlling for Potential Mediators

Research Question 4: Does first-generation college graduate status have a significant relationship to health while controlling for health behavior, stress and social support?

Hypothesis 4a1: Physical activity will mediate the relationship between first-generation status and BMI.

Hypothesis 4a2: Physical activity will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4a3: Fast food consumption will mediate the relationship between first-generation status and BMI.

Hypothesis 4a4: Fast food consumption will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4a5: Sugar-sweetened beverage consumption will mediate the relationship between first-generation status and BMI.

Hypothesis 4a6: Sugar-sweetened beverage consumption will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4a7: Smoking will mediate the relationship between first-generation status and BMI.

Hypothesis 4a8: Smoking will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4b1: Stress will mediate the relationship between first-generation status and BMI.

Hypothesis 4b2: Stress will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4c1: Receipt of social support will mediate the relationship between first-generation status and BMI.

Hypothesis 4c2: Receipt of social support will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4c3: Provision of social support to mother/mother figure will mediate the relationship between first-generation status and BMI.

Hypothesis 4c4: Provision of social support to mother/mother figure will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4c5: Provision of social support to father/father figure will mediate the relationship between first-generation status and BMI.

Hypothesis 4c6: Provision of social support to father/father figure will mediate the relationship between first-generation status and blood pressure.

There is a dearth of literature on first-generation college graduates and health outcomes. The direction of these hypotheses are based on the literature indicating that first-generation college students are more likely than their peers to be racial/ethnic minorities, financially independent, have dependents, and come from low-income backgrounds (Horn & Nunez, 2000). As discussed in the literature review, these factors have been associated with a variety of adverse health outcomes. Increased education has been shown to be associated with better health outcomes through access to resources that promote health, for example control over job opportunities and access to engagement in health promoting/risk-preventing activities. In this respect, it is hypothesized that health

outcomes will differ for first-generation college graduates, with mean BMI and blood pressure being higher among this group. As demonstrated in literature, physical activity, diet and smoking can have a negative impact on health, contributing to chronic disease. In this respect, these health behaviors are suggested as potential mediators of the relationship between first-generation college graduate status and health. As discussed in the literature review, increased education is associated with better health outcomes due to access to health-promoting resources. However, the literature of first-generation college students suggests significant financial barriers experienced by this group. There is a dearth of literature on first-generation college graduates, hence the need for this study, so it is difficult to hypothesize a direction for health behaviors of first-generation college graduates. Although the limited evidence is mixed, perhaps financial barriers of first-generation college students carry over into adulthood, limiting access to certain resources and thus individual health behaviors may differ by college generation status. It is hypothesized that there will be differences for the stress and social support mediators based on the same literature that indicates first-generation college students are more likely to have more financial burden in college (needing to work, having dependents, etc.) than their continuing generation counterparts and this may carry on into adulthood (IHEP, 2012). It is hypothesized that health behaviors, stress and social support will mediate the relationship between college generation status and health.

Chapter 3. Methods

3A. Methods Overview

Data from the National Longitudinal Study of Adolescent to Adult Health (Add Health) is used to explore the relationships between first-generation college graduate status (main independent variable) and health as measured by BMI and blood pressure (dependent variables); and the role of health behaviors, stress and social support as potential mediators. More specifically, data primarily from WAVE IV is used, in addition to selected precursor variables from WAVE I. The dataset allows for a nationally representative examination of individual and interpersonal influences on health in adolescence and into early adulthood. Most importantly, for the current study, Add Health data afforded an opportunity to investigate parent-reported data on family and its relationship to health outcomes of college graduates initially surveyed in Wave I, now in adulthood in Wave IV. Physical measurements and bio-specimen collection in Wave IV are an additional strength of the Add Health dataset and are used in the current study.

3B. Protection of Human Subjects

George Washington University Institutional Review Board (IRB) approval (IRB #031530) was secured prior to accessing the Restricted-Use National Longitudinal Adolescent to Adult Health dataset. The study is classified as “minimal risk” since it is a secondary analysis of de-identified, sensitive data.

3C. The Add Health Study Sample, Design, and Procedure

The data used in this secondary analysis was collected from the National Longitudinal Study of Adolescent to Adult Health (Add Health), a nationally representative sample of adolescents in grades 7-12 in the United States during the 1994-

95 academic year (http://www.cpc.unc.edu/projects/addhealth/design) (Harris, Halpern & Whitsel et al., 2009). Systematic sampling methods and implicit stratification was used to ensure that the 80 high school clusters selected for the study were representative of U.S. schools with respect to region of country, urbanicity, size, type and ethnicity. A school was eligible for the sample if it included an 11th grade and had a minimum enrollment of 30 students. Schools that included a 7th grade and sent at least five graduates to a high school in the study (feeder schools) were selected based on a probability proportional to the number of students it contributed to the high school. Overall, there are 132 schools in the core study. The Add Health cohort was followed into early adulthood with four in-home interviews (waves), the most recent administered in 2008, when the majority of the sample was aged 24-32.

As part of Wave I of the study, an in-school questionnaire was administered to 90,118 students. All students who completed the in-school questionnaire and those who did not complete a questionnaire but were listed on a school roster were eligible for selection into the core, in-home sample with a resulting size of 20,745 students. A total of 17,670 parents completed an in-home questionnaire about family and relationships. The data collected included information on social, economic, psychological and physical well-being of adolescents with contextual data on family, neighborhood, community, school, friendships, peer groups, and romantic relationships.

Wave IV, the most recent wave, surveyed the original Wave I participants in 2007-2008. A total of 92.5% of the Wave IV sample were located and 80.3% of eligible sample members interviewed (n = 15,701). At the time of the interview, respondents were adults aged 24-32. Wave IV expanded the collection of biological data (i.e. height,

weight, blood pressure, HbA1c) with physical measurements in Add Health, to help understand the social, behavioral, and biological linkages in health trajectories as the Add Health cohort aged through adulthood. An overview of the study design is pictured below (see Figure 3.1) (Harris, Halpern & Whitsel et al., 2009). Figure 3.2 displays populations in the selected waves of Add Health.

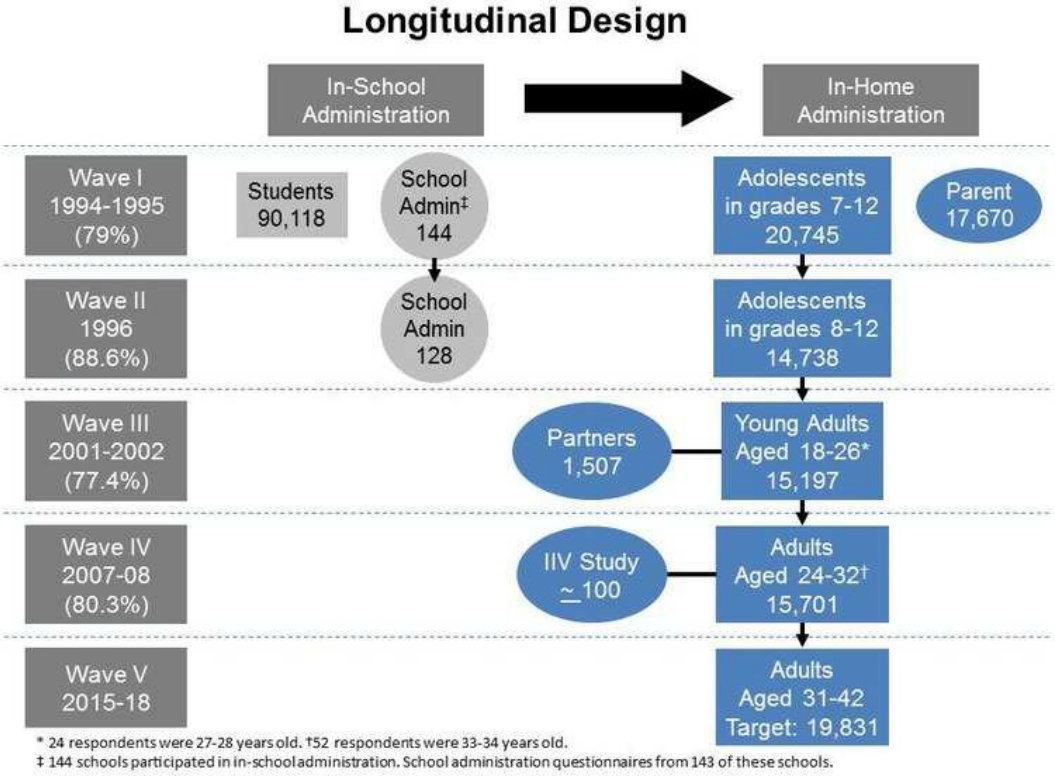


Figure 3.1. Add Health Study Design

Wave I

- 90,118 adolescent In-School Questionnaires (September 1994–April 1995)
- 20,745 adolescent In-Home Interviews (April 1995–December 1995)
- 17,669 Parent Questionnaires (parent specific component)
- 17,713 Parent Questionnaires (child specific component) (April 1995–December 1995)

Wave IV

- 15,701 adult In-Home Interviews and biomarker collection (April–June 2007 (pretest), January 2008–February 2009 (main study)

Figure 3.2. Summary of Populations in Selected Waves & Questionnaires

3D. Current Study Sample

The study sample is drawn from respondents who reported having earned a 4-year college degree or higher level of education in Wave IV of the Add Health study resulting in a study sample of 4,953, or 31.5% of the Wave IV follow-up sample. The Add Health dataset contains a nationally representative sample of the population and the survey design of this study was taken into consideration using sample weights to account for oversampling of select populations, bringing the college graduate population sample from n = 4,953 to n = 4,737 (weighted to represent a US Population size = 6,572,363). Responses to demographic questions in Wave I were matched by respondent ID's in Wave IV. Parent questionnaires filled out in Wave I were matched to the adult college graduate sample drawn from Wave IV. Not all parents completed a questionnaire at Wave I. For the adult college graduate sample, 657 parent surveys were missing. Adult college graduate or adolescent-reported information on highest level of parental education was used where the parent-reported information was missing.

3D1. Adjustment for a Complex Survey Sampling Design

The present study's analysis used Stata Version 13.1 SE. This software enabled adjustment for the complex sampling design of the Add Health survey during calculation of (a) point estimates and (b) standard errors for hypothesis testing. To adjust for the complex sampling design of Add Health, the beginning of the Stata analysis issued the following program command: "svyset PSUSCID [pweight = GSWGT4_2], strata(REGION)." The first part of this program command provided information about the primary stage units, strata, and weights. Most of the remainder of the Stata analysis (e.g., generation of descriptive statistics and linear and logistic regression analyses) used

the prefix "svy". If the present study indicated that the data were unweighted, the Stata analysis did not use the prefix and thus did not adjust for the complex sampling design. In general, the results from statistical testing were "significant" if the p-value was at or below 0.05. They were "nearly significant" or "almost significant" if the p-value was above 0.05 but at or below 0.10. Continuing generation college graduates were the referent group for analyses (0 = continuing generation college graduates and 1 = first-generation college graduates). Therefore, they were the referent for multivariable regressions that involved covariates.

3E. Measurement/Description of Variables

The main independent variable of the current study, **first-generation college graduate status,** was defined as neither parent having earned a 4-year college degree (Center for Student Opportunity, 2014). An individual's first-generation college graduate status was determined using data on highest level of parental education achieved (Parent Questionnaire in Wave I Add Health survey). An individual who indicated having completed a 4-year college degree or higher for the "highest education level achieved to date" item in Wave IV, rendered that individual eligible for the sample. There was no response option indicating graduation from a 2-year college in Add Health. Respondents who completed vocational training following high school are not included in the college graduate sample. Table 3.1 presents a summary of the variables and measurement for the current study.

3E1. First-Generation Status

First-Generation College Graduate. There is no single, universal definition for a "first-generation" college student/graduate. The definition used in the current study is "neither

parent having completed a 4-year college (bachelor's) degree (Center for Student Opportunity, 2014)." This definition has been adopted by many colleges and universities as it is among the most inclusive definition of first-generation college students. It includes those students whose parents may have enrolled in college, but never completed it or those whose parents have attended a 2-year college. The first-generation college graduate variable for the current study is a constructed, dichotomous variable based on several variables including the parent's responses to the question, "How far did you go in school?" and "How far did your current (spouse/partner) go in school?" on the Wave I survey. In cases where parent data was not available for a college graduate respondent (657 out of 4,953 unweighted cases or 13.26%), adolescent-reported parent education was used as captured in the questions regarding the respondent's residential parents: "How far in school did your biological mother go?," and "How far in school did your biological father go?" The education level of non-resident parents was also considered if a respondent indicated that they had ever lived with that parent. A respondent was considered a first-generation college graduate if neither their residential or non-residential parent or parent's spouse/current partner indicated "Graduated from college/university" or "Prof training beyond 4-year college/university," or in the cases when the adolescent respondent's answers where used, if they indicated the same. As a point of note, the Add Health dataset did not have a response option for completion of 2-year college degrees, which was suitable for the current study's definition of first year college graduates.

3E2. Potential Mediators

Physical Activity. Moderate-to-vigorous physical activity is a dichotomous variable created from a continuous variable that was assessed with a standard 7-day recall

questionnaire methodology (Andersen, Crespo, Bartlett, Cheskin, & Pratt, 1998; McCullough & Marks, 2014). In Add Health Wave IV, respondents were asked about the times per week they participated in selected activities, for example, "In the past seven days, how many times did you participate in gymnastics, weight lifting, or strength training?" and "In the past seven days, how many times did you walk for exercise?" As used in previous work, the physical activity summary variable was constructed by summing together participation in 7 moderate-to-vigorous physical activities for the week. Responses for each item could range from 0 to 7 (7 or more times) therefore, the responses for the physical activity variable could range from 0 to 49. The distribution was positively-skewed for college graduates, thus the variable was dichotomized into participation below the median (0) and participation at or above the median (1). This is a common approach used in social science research typically when a variable is skewed – a variable is split at some point on the scale of measurement with a common dichotomization being the median split where a variable is split at the median to form high and low groups (MacCallum, Zhang, Preacher, & Rucker, 2002; Streiner, 2002). This study used median as the split point. However, since the "detail" command, which describes median, was not supported by the "survey" command in Stata/SE 13.1 (used throughout the analysis to account for the survey design and potential oversampling of the survey), the median represents that of the whole, unweighted college graduate sample n = 4,953 as opposed to n = 4,737.

Fast Food Consumption. Fast food consumption is a dichotomous variable created from a continuous variable that was assessed using a standard 7-day recall questionnaire methodology as used in previous research (Andersen et al., 1998; McCullough & Marks,

2014). Respondents in Wave IV were asked one question about the times per week they ate fast food: "How many times in the past seven days did you eat food from a fast food restaurant, such as McDonald's Burger King, Wendy's Arby's, Pizza Hut, Taco Bell, or Kentucky Fried Chicken or a local fast food restaurant?" with responses from 0 to 7 (7 or more times). The distribution was positively-skewed for college graduates, thus the variable was dichotomized into participation above the median (0) and participation at or below the median (1).

Sugar-Sweetened Beverage Consumption. Similar to fast food consumption, sugar-sweetened beverage consumption is a dichotomous variable created from a continuous variable that was assessed using a 7-day recall methodology. Respondents were asked in Wave IV, "In the past 7 days, how many regular (non-diet) sweetened drinks did you have? Include regular soda, juice drinks sweetened tea or coffee, energy drinks, flavored water, or other sweetened drinks." Responses were numeric. The distribution was positively-skewed for college graduates, thus the variable was dichotomized into participation above the median (0) and participation at or below the median (1).

Smoking. Having ever smoked was assessed with 1-item asking respondents in Wave IV "Have you ever smoked cigarettes regularly – that is, at least one cigarette every day for 30 days?" The responses were dichotomized to yes/no.

Stress Scale. A stress scale was constructed from summing five survey items concerning respondent's subjective assessments of stress in the Social Psychology and Mental Health section of Wave IV, as done in previous research (Cutler & Lleras-Muney, 2006). For example, participants were asked, "In the last 30 days, how often have you felt that you were unable to control the important things in your life?" and "In the last 30 days, how

often have you felt confident in your ability to handle your personal problems (reverse coded)"? The five items were grouped together with a resulting Cronbach's alpha (α) reliability score of 0.73, which is considered acceptable in most social science research (DeVellis, 2012).

Social Support. One dimension out of the four dimensions of social support proposed by House (1981) was measured – instrumental support. Instrumental support is a broad category of supportive behaviors that can involve the provision of tangible aid and services that directly assist a person in need, for example, money (Glanz, Rimer, & Lewis, 2002). As mentioned in the literature review, first-generation college students are more likely to come from low-income backgrounds, so this dimension of social support is particularly relevant to the current study (Horn & Nuñez, 2000).

Instrumental Social Support Received. Instrumental social support received was assessed with one item in Wave IV asking respondents, "Have [you (or your spouse/partner)] ever received any financial gifts or loans from your parents, in-laws, or relatives to help you buy, remodel, build or furnish a home or condominium?" Responses were dichotomous yes/no.

Instrumental Social Support Provided (to Mother/Mother Figure and Father/Father Figure). Instrumental social support provided was assessed by 1-item each that asked about the respondent's mother/mother figure and father/father figure (a total of two items). The item was as follows, "How many times have you paid your (mother/mother figure's) living expenses or given her more than $50 to pay living expenses during the past 12 months?" The responses in the survey were categorical including "Never", "Yes, number of times unknown," "Yes, 1 or 2 times" and "Yes, 3 or 4 times." For the current

study, the responses were dichotomized to yes/no "provided" or "did not provide support." The item was the same for father/father figure.

3E3. Health Outcomes

Body Mass Index (BMI). BMI is a continuous variable constructed from field interviewer measured height and weight of respondents during Wave IV administration of Add Health. BMI is an individual's weight in kilograms divided by the square of height in meters and is a commonly used measure of one's body fat composition (CDC, 2015). BMI is classified into categories: an individual with a BMI of below 18.5 is classified as "underweight," 18.5 - 24.9 "normal or healthy weight," 25.0 – 29.9 as "overweight," and 30.0 and above as "obese."

Blood Pressure. Blood pressure is constructed in Add Health as an average of field interviewers 2nd and 3rd measure of systolic and diastolic pressure. When one of the second and third measures was missing, the other single measure was used. In the cases when both measures 2 and 3 were missing, the first measure was used. Blood pressure is categorized as follows: systolic <120 and diastolic <80 is "normal," systolic 120-139 or diastolic 80-89 is "prehypertension," systolic 140+ or diastolic 90+ is "hypertension." Blood pressure was dichotomized into normal vs. prehypertension/hypertension for the current study.

3E4. Demographic Characteristics

Age. This is the age of respondents during Wave IV administration of the Add Health Survey. Month, day and year of the interview were each coded by the Add Health interviewer. In the "Overview and Demographics" section of Wave IV, respondents were asked their "date of birth – month" and "date of birth – year." In the current study, age

was constructed by subtracting the respondent's birth date month and year from month and year of survey administration. Since individuals were in 7^{th} – 12^{th} grade at Wave I administration, the age range of respondents at Wave IV is 24 – 32 years old.

Race. Race is a categorical variable self-identified at Wave I and constructed from several individual race "dummy" variables. Interviewers asked respondents, "What is your race?" Five categories were listed including: White, Black or African American, American Indian or Native American, Asian or Pacific Islander and Other. Hispanic origin is considered a race category for the purpose of the current study, similar to other studies utilizing Add Health data.

Ethnicity. Ethnicity is self-identified at Wave I administration of the Add Health Survey and is a dichotomized variable constructed from the question: "Are you of Hispanic or Latin origin?" Responses were dichotomized into yes or no/don't know/refused.

Sex. Sex is a categorical, dichotomized variable (male or female) self-identified at Wave IV survey administration.

Current Household Income. A key component of socio-economic status, current household income is a measure of the adult respondent's household income before taxes in 2006/2007/2008, during Wave IV administration. Respondents were prompted with the following, "Thinking about your income and the income of everyone who lives in your household and contributes to the household budget, what was the total household income before taxes and deductions in [2006/2007/2008]? Include all sources of income, including non-legal sources. (Income data are important in analyzing the health information we collect. For example, the information helps us to learn whether persons in one income group use certain types of medical care services or have conditions more or

less often than those in another group.)" This variable is categorical and ordinal, identifying income ranges, for example $0-$24,9999, $25,000 to $49,999, etc. It was also dichotomized into 0 = ≥$50,000, and 1 = <$50,000 for college graduates (approximate median household income for 2008), for use with logistic regression analysis.

Access to Health Insurance. This variable was constructed from the question "Which of the following best describes your current health insurance situation?" The responses included: "you have no health insurance," "you get insurance through work," "you get insurance through a union," "you get insurance through school," "you are covered by your husband's or wife's insurance," "you are covered by your parent's insurance," "you are covered because you are active duty military," "you buy private insurance yourself," "you are on Medicaid," "you are covered through the Indian Health Service," "you do not know what your health insurance is" and "don't know." This variable was dichotomized to "yes" and "no" for having some form of access to health insurance at Wave IV administration.

Parent-reported Adolescent Family Income. Family income is a critical variable to the current study as youth from lower income families tend to lack resources and opportunities that lead to better outcomes as adults. One in ten youth from low-income families (10%) continue on to graduate from a four-year college, compared with 28% of youth from middle-income families and 50% of youth from high-income families (Kent, 2009). This is a continuous variable constructed from numeric responses given by parents of adolescent responses to the question, "About how much total income, before taxes did your family receive in 1994?" on the parent questionnaire administered during Wave I of the survey. Not all parents/guardians were available to fill out corresponding surveys.

Multiple imputation methods for missing data were used to account for this missing data in the multivariate analysis. Adolescent family income was also dichotomized into 0 = above, and 1 = below the median for college graduates, for use with logistic regression analysis.

Table 3.1. Summary of Variables, Measurement and Response Options

Variable	Level of Measurement	Responses
BMI	Continuous	14.7 – 75.4
BMI	Ordinal Categorical	0 = Underweight: <18.5 1 = Normal: 18.5-<25 2 = Overweight: 25-<30 3 = Obese: 30+
Blood Pressure	Categorical	0 = Normal 1 = Prehypertension/Hypertension
First-generation College Status	Categorical	0 = Continuing Generation College Graduate 1 = First-Generation College Graduate
Race	Categorical	0 = White 1 = Black or African American 2 = American Indian or Native American 3 = Asian or Pacific Islander 4 = Other 5 = Hispanic, all races
Race (Dichotomized)	Categorical	0 = White 1 = Black or African American, American Indian or Native American, Asian or Pacific Islander, Other & Hispanic, all races
Ethnicity	Categorical	0 = Not of Hispanic origin 1 = Hispanic
Sex	Categorical	0 = Male 1 = Female
Age	Continuous	24 - 34
Access to Health Care Insurance	Categorical	0 = No access 1 = Access
Current Household Income	Categorical	0 = $0 – $24,999 1 = $25,000 - $49,999 2 = $50,000 - $74,999 3 = $75,000 - $99,999

		4 = $100,000 - $149,999 5 = $150,000+ 6 = Refused/Don't Know
Current Household Income (Dichotomized)	Categorical	0 = ≥ $50,000 1 = < $50,000
Adolescent Family Income	Continuous	0 – 999 (thousands)
Adolescent Family Income (Dichotomized)	Categorical	0 = above median for sample 1 = below median for sample
Physical Activity	Categorical	0 = below median for sample 1 = equal/above median for sample
Fast-food Consumption	Categorical	0 = above median for sample 1 = equal/below median for sample
Sugar-sweetened beverages	Categorical	0 = above median for sample 1 = equal/below median for sample
Smoking	Categorical	0 = No 1 = Yes
Stress Scale	Ordinal Continuous	0 = Never 1 = Almost never 2 = Sometimes 3 = Fairly often 4 = Very often
Instrumental support received	Categorical	0 = No 1 = Yes
Instrumental support provided (Mother/Mother Figure)	Categorical Ordinal	0 = Never (no) 1 = Yes, 1 or more times
Instrumental support provided (Father/Father Figure)	Categorical Ordinal	0 = Never (no) 1 = Yes, 1 or more times

3F. Data Analysis Procedures

3F1. Overview

The data was analyzed using univariate, bivariate, and multivariate analytical methods. Univariate analyses were used to assess the normality of the data and examine the frequency of missing data. In addition, it was used to provide a description of first-generation college graduates (descriptive aim for the current study). Bivariate and multivariate analyses were used to assess the relationship between first-generation college graduate status and health, as well as the relationships between potential mediating variables and health. The specific analyses used, varied according to the type of dependent variable (continuous or categorical) being assessed by the research question and included survey-equivalent ANOVA, chi-square analyses, linear, and logistic regression. Stata 13.1 SE statistical software was used for the analyses.

The descriptive aims primarily involved univariate and bivariate analysis to describe first-generation college graduates and to compare first-generation college graduates and continuing generation college graduates on selected demographic characteristics.

Research Questions 1-4 followed Baron and Kenny's steps for mediation analysis (1986); see Figure 3.3 for an example of a simple mediation model. These steps were used to assess the relationship between first-generation college graduate status and health, and the roles of health behaviors, support and stress as potential mediators of the relationship.

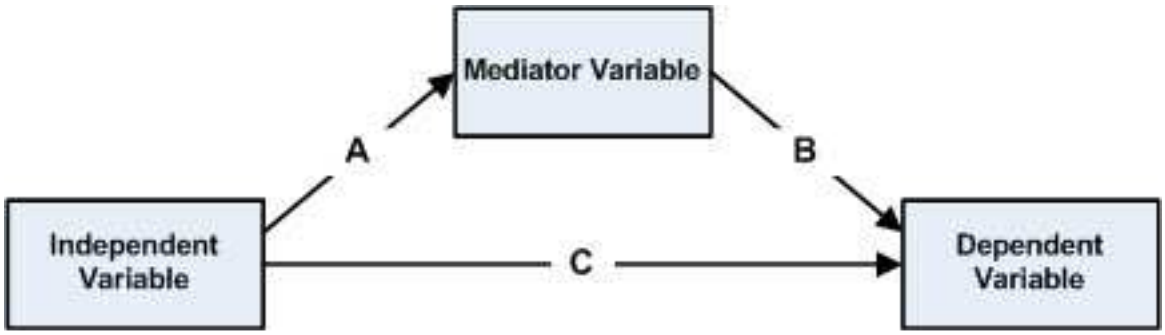


Figure 3.3. Mediation Model

3F2. Data Analysis Procedures

Before analyses, variables were inspected for missing data and normality of distribution. If deviations were observed, the use of parametric tests were not be precluded. For health behaviors, stress and social support with a significant first-generation effect, a series of ordinary least squares regression models or logistic regression models were calculated to test the following mediation conditions on BMI and blood pressure (dependent variable [DV1, DV2]): (1) the independent variable (IV) must be significantly associated with the DVs, (2) the IV must be significantly associated with the mediator variable (MV), (3) the MV must be significantly associated with the DVs, and (4) the impact of the IV on the DV is less after controlling for the MV. Models run in Step 4 of the mediation analysis, which controlled for potential mediators, were re-run to include adolescent family income (continuous) as a control variable. Data was analyzed in Stata/SE version 13.1 and managed by the researcher. Review of data included checking that assumptions were met for statistical analysis.

3F3. Descriptive Analysis

Univariate and bivariate analysis, including mean and proportion estimation, was conducted to provide descriptive statistics on the college graduate study sample, and to compare the first-generation college graduate and continuing generation college graduate

sub-samples. Mean and frequency distribution was conducted for age, sex, race, ethnicity, current household income, access to health insurance and parent-reported adolescent family income. Grand sample weights were incorporated into the data analysis to account for the survey sample design. Inferential statistics, including logistic regression analysis, were used to determine the likelihood of first-generation college graduates exhibiting selected demographic characteristics.

3F4. Test of Hypotheses

The hypotheses for the four research questions were tested as outlined below. An alpha of 0.05 was used to determine statistical significance of findings.

3F4a. Hypothesis 1: First-Generation Status and Outcome Variables

Hypothesis 1a: First-generation college status will be associated with increased BMI among college graduates.

To test hypothesis 1a, a linear regression analysis was completed to see if first-generation college graduate status was significantly associated with BMI.

Hypothesis 1b: First-generation college status will be associated with increased likelihood of prehypertension/hypertension.

To test hypothesis 1b, logistic regression analysis was used to see if first-generation college graduate status was associated with a higher likelihood of prehypertension/hypertension (normal vs. prehypertension/hypertension).

3F4b. Hypothesis 2: Potential Mediators and First-Generation Status

Hypothesis 2a1: Participation in physical activity will differ by first-generation college graduate status among college graduates.

To test hypothesis 2a1, logistic regression analysis was used to see if first-generation college graduate status was significantly associated with participation in physical activity among college graduates.

Hypothesis 2a2: Fast food consumption will differ by first-generation college graduate status among college graduates.

To test hypothesis 2a2, logistic regression analysis was used to see if first-generation college graduate status was significantly associated with fast food consumption.

Hypothesis 2a3: Sugar-sweetened beverage consumption will differ by first-generation college graduate status among college graduates.

To test hypothesis 2a3, logistic regression analysis was used to see if first-generation college graduate status was significantly associated with sugar-sweetened beverage consumption.

Hypothesis 2a4: Smoking will not differ by first-generation status among college graduates.

To test hypothesis 2a4, logistic regression analysis was used to see if first-generation college graduate status was significantly associated with history of smoking.

Hypothesis 2b: First-generation status will be associated with higher reported stress.

To test hypothesis 2b, linear regression analysis was used to see if first-generation college graduate status was significantly associated with increased stress (5-item scale).

Hypothesis 2c1: First-generation status will be significantly associated with lower likelihood of receipt of instrumental family support among college graduates.

To test hypothesis 2c1, logistic regression analysis was used to see if first-generation college graduate status was significantly associated with receipt of instrumental social support.

Hypothesis 2c2: First-generation status will be associated with higher likelihood of provision of instrumental support to a mother/mother figure among college graduates.

To test hypothesis 2c2, logistic regression analysis was used to see if first-generation college graduate status was significantly associated with provision of social support to mother/mother figure among college graduates.

Hypothesis 2c3: First-generation status will be associated with higher likelihood of provision of instrumental support to a father/father figure among college graduates.

To test hypothesis 2c3, logistic regression analysis was used to see if first-generation college graduate status was significantly associated with provision of social support to father/father figure among college graduates.

3F4c. Hypothesis 3: Potential Mediators and Health

Hypothesis 3a1: Higher participation in physical activity will be associated with lower BMI.

To test hypothesis 3a1, a linear regression was used to see if participation in physical activity was significantly associated with BMI.

Hypothesis 3a2: Higher physical activity will be associated with lower blood pressure.

To test Hypothesis 3a2, logistic regression analysis was used to see if physical activity participation varied by blood pressure classification.

Hypothesis 3a3: Higher fast food consumption will be associated with higher BMI.

To test hypothesis 3a3, linear regression analysis was used to see if BMI was significantly associated with fast food consumption.

Hypothesis 3a4: Higher fast food consumption will be associated with higher blood pressure.

To test hypothesis 3a4, logistic regression analysis was used to see if fast food consumption was significantly associated with BMI.

Hypothesis 3a5: Higher sugar-sweetened beverage consumption will be associated with higher BMI.

To test hypothesis 3a5, linear regression analysis was used to see if sugar-sweetened beverage consumption was significantly associated with BMI.

Hypothesis 3a6: Higher sugar-sweetened beverage consumption will be associated with higher blood pressure.

To test hypothesis 3a6, logistic regression analysis was used to see if sugar-sweetened beverage consumption significantly differed by blood pressure classification.

Hypothesis 3a7: History of smoking will be associated with higher BMI.

To test hypothesis 3a7, logistic regression analysis was used to see if history of smoking was significantly associated with BMI.

Hypothesis 3a8: History of smoking will be associated with higher blood pressure.

To test hypothesis 3a8, logistic regression analysis was used to see if history of smoking significantly differed by blood pressure classification.

Hypothesis 3b1: Higher stress will be associated with higher BMI.

To test hypothesis 3b1, linear regression analysis was used to see if stress was significantly associated with BMI.

Hypothesis 3b2: Higher stress will be associated with higher blood pressure.

To test hypothesis 3b2, logistic regression analysis was used to see if mean summed stress varied by blood pressure classification.

Hypothesis 3c1: Receipt of social support will be associated with lower BMI.

To test hypothesis 3c1, linear regression analysis was used to see if receipt of social support was associated with lower BMI.

Hypothesis 3c2: Receipt of social support will be associated with lower blood pressure.

To test hypothesis 3c2, logistic regression analysis was used to see if receipt of social support was significantly associated with blood pressure classification.

Hypothesis 3c3: Provision of social support to mother/mother figure will be associated with higher BMI.

To test hypothesis 3c3, linear regression analysis was used to see if BMI was significantly associated with provision of social support to mother/mother figure.

Hypothesis 3c4: Provision of social support to mother/mother figure will be associated with higher blood pressure.

To test hypothesis 3c4, logistic regression analysis was used to see if provision of social support to mother/mother figure was significantly associated with blood pressure classification.

Hypothesis 3c5: Provision of social support to father/father figure will be associated with higher BMI.

To test hypothesis 3c5, linear regression analysis was used to see if BMI differed by provision of social support to father/father figure.

Hypothesis 3c6: Provision of social support to father will be associated with lower blood pressure.

To test hypothesis 3c6, logistic regression analysis was used to see if provision of social support to father/father figure was significantly associated with blood pressure classification.

3F4d. Hypothesis 4: First-Generation Status and Health, Controlling for Mediators

Mediation Analysis: The proposed mediators were hypothesized to fully (or partially) mediate the relationship between first-generation status and health. To test the hypothesis 4a1 – 4c4, linear or logistic regression was used as appropriate depending on the nature of the dependent variable in the model (categorical or continuous). Only the mediators that proved to be significant in hypothesis 3 and 4 were used in the last step to test for mediation of the relationship between first-generation college graduate status and health. The final mediation step models are presented as unadjusted (not controlling for adolescent income). Models were run again to adjust for adolescent family income and maintained the same significance as the unadjusted models; they are presented in the results section.

Hypothesis 4a1: Physical activity will mediate the relationship between first-generation status and BMI.

Hypothesis 4a2: Physical activity will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4a3: Fast food consumption will mediate the relationship between first-generation status and BMI.

Hypothesis 4a4: Fast food consumption will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4a5: Sugar-sweetened beverage consumption will mediate the relationship between first-generation status and BMI.

Hypothesis 4a6: Sugar-sweetened beverage consumption will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4a7: Smoking will mediate the relationship between first-generation status and BMI.

Hypothesis 4a8: Smoking will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4b1: Stress will mediate the relationship between first-generation status and BMI.

Hypothesis 4b2: Stress will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4c1: Receipt of social support will mediate the relationship between first-generation status and BMI.

Hypothesis 4c2: Receipt of social support will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4c3: Provision of social support to mother/mother figure will mediate the relationship between first-generation status and BMI.

Hypothesis 4c4: Provision of social support to mother/mother figure will mediate the relationship between first-generation status and blood pressure.

Hypothesis 4c5: Provision of social support to father/father figure will mediate the relationship between first-generation status and BMI.

Hypothesis 4c6: Provision of social support to father/father figure will mediate the relationship between first-generation status and blood pressure.

Mediation Analysis Step 1:

The dependent variables, BMI and blood pressure, were each individually regressed on the independent variable (first-generation college graduate status). This step aimed to confirm that the first-generation college graduate status was significantly associated to BMI and blood pressure.

Mediation Analysis Step 2:

Regression analysis was used for the second steps of the mediation analysis. The mediator variables (health behavior, stress and social support) were regressed on the independent variable (first-generation college graduate status). This step aimed to confirm that first-generation college graduate status was significantly associated with the mediators. If the mediators were not associated with the independent variable, then they did not mediate.

Mediation Analysis Step 3:

The mediator variables (physical activity, fast food and sugar-sweetened beverage consumption, smoking, stress, receipt and provision of social support) were each regressed on the dependent variables (BMI and blood pressure). This step aimed to confirm that the mediators affected the outcome variables. If the mediator was not associated with the outcome variables, then it did not mediate.

Mediation Analysis Step 4:

The dependent variables (BMI and blood pressure) were regressed individually on both the mediators (health behaviors, stress, social support) and independent variable (first-generation college graduate status). This step served to confirm that the mediators were significant predictors of the dependent variable, while controlling for the independent variable. This step involved showing that when the mediator and the independent variable are used simultaneously to test for significant associations with the dependent variable, the previously significant path between the independent and dependent variable (Step #1) is now greatly reduced, if not non-significant (Baron & Kenny, 1986).

Chapter 4. Results

4A. Results Overview

Two descriptive aims, four research questions and corresponding hypotheses were tested in the current study to investigate the demographic profile of first-generation college graduates and their continuing generation peers, the potential effect of first-generation college status on health among college graduates and the potential role of mediators such as health behaviors, stress and social support on the relationship between first-generation status and health. The hypotheses and corresponding results are presented below.

4B. Descriptive Aims

Descriptive Aims: 1) What is the socio-demographic profile of college graduates, in general, in young adulthood?

2) What is the socio-demographic profile of college graduates stratified by first-generation college graduate status in young adulthood?

Hypotheses: These are not applicable since these are descriptive aims.

In order to investigate the descriptive aims, seven univariate analyses were carried out to describe seven demographic variables of college graduates: age, sex, race, ethnicity, current household income before taxes, access to health insurance and parent-reported adolescent family income. Bivariate analysis was carried out to investigate any differences in demographic characteristics between first and continuing generation college graduates.

The mean age of the overall college graduate sample was 28.78 (SD: 0.12, 95% CI [28.54, 29.02]). A greater percentage of college graduates are females as compared to males (55% to 45%). The college graduate sample is predominantly White (73.24%), 10.96% African American or Black and 7.46% Hispanic in terms of race and ethnicity (Table 4.1). The current household income range in which most college graduates fall is $50,000 - $74,999 (24.14%) and almost all except 10% have some form of access to health insurance. Lastly, the median household income of the college graduates' parents when the sample was first surveyed as adolescents in Wave I was $51,000, with almost one-third of parents falling in the $50,000 - $74,999 household income range. The survey-adjusted sample of 4,737 respondents represented a national population size of approximately 6,572,363 people. This population size was lower in some instances, for example 5,750,707, when it represented some variables with missing observations, i.e. n = 4,079 for instrumental support provided to father/father figure.

Table 4.1. Characteristics of College Graduates

Characteristics	n	Percent
Percent of sample	4,737	100%
Sex		
Male	1,932	45%
Female	2,805	55%
Race		
White	2,748	73.24%
Black or African American	858	10.96%
Native American & Other	134	2.72%
Asian or Pacific Islander	468	5.62%
Hispanic, all races	529	7.46%
Ethnicity		
Not Hispanic	4,208	92.54%
Hispanic	529	7.46%
Current Household Income Before Taxes		

$0 - $24,999	309	7.65%
$25,000 - $49,999	966	20.2%
$50,000 - $74,999	1,129	24.14%
$75,000 - $99,999	925	18.99%
$100,000 - $149,000	808	17.29%
$150,000 or more	437	8.52%
Refused/Don't know	163	3.22%
Access to Health Insurance		
Yes	4,305	90.5%
No/Don't Know/Refused	432	9.5%
Parent Reported Adolescent Family Income**	$51,000	
$0 - $24,999	510	12.5%
$25,000 - $49,999	1,051	26.93%
$50,000 - $74,999	1,098	32.50%
$75,000 - $99,999	526	14.56%
$100,000 - $149,000	308	8.81%
$150,000 or more	166	4.69%

**Reflects n=3,823, college graduate observations with parent-reported income data for the unweighted survey sample as report of median is not available with the "survey" command

Among a nationally representative sample of adolescents that attended and graduated from college (Table 4.2), 44.29% are first-generation college graduates, a statistically significantly lower percent of college graduates as compared to the 55.71% that are continuing generation college graduates (Adjusted Wald Test: $F(1,125) = 5.51$, Prob >F = 0.02). The mean age of continuing and first-generation college graduates is 28.69 and 28.89, respectively ([$F(1,125) = 5.51$, Prob>F = 0.02]). Continuing generation females make up the largest percent of college graduates (29.72%) while first-generation males make up the smallest percent of college graduates (18.96%). In terms of race, the majority of college graduates are White with 43.35% being continuing generation and 29.89% being first-generation college graduates. Within categories of African Americans and Hispanics of all races, a larger percentage of college graduates are first-generation rather than continuing generation, for example, 6% of African American college

graduates are first-generation whereas 4.92% of African Americans are continuing generation college graduates. Among college graduates, the current household income range in which most lie is $50,000 - $74,999 for both continuing generation and first-generation individuals (12.2% and 11.94%, respectively). The median parent-reported income of continuing generation college graduates is statistically significantly different and greater than that of first-generation college graduates at $63,000 as compared to $40,000, respectively.

Table 4.2. College Graduate Characteristics Stratified by Generation Status

Characteristics	**Continuing Generation n=2,659**	**First-Generation n = 2,078**
Percent of College Graduate Sample	**55.71%**	**44.29%**
Sex		
Male	25.99%	18.96%
Female	29.72%	25.34%
	100% Pearson: Uncorrected chi2(1) = 6.998 Design-based F(1,125) = 3.2634 P=0.0732	
Race		
White	43.35%	29.89%
Black or African American	4.92%	6.04%
Native American & Other	1.49%	1.23%
Asian or Pacific Islander	3.50%	2.12%
Hispanic, all races	2.44%	5.02%
	100% Pearson: Uncorrected chi2(4) = 122.1902 Design-based F(3.60, 450.57) = 10.0316 P=0.0000	
Ethnicity		
Not Hispanic	53.27%	39.27%
Hispanic	2.44%	5.02%
	100% Pearson: Uncorrected chi2(1) = 82.0369 Design-based F(1,125) = 28.8731 P=0.0000	
Current Household Income Before Taxes		

$0 - $24,999	4.64%	3.01%
$25,000 - $49,999	10.69%	9.52%
$50,000 - $74,999	12.2%	11.94%
$75,000 - $99,999	10.28%	8.71%
$100,000 - $149,000	10.37%	6.93%
$150,000 or more	6.07%	2.45%
Refused/Don't know	1.47%	1.75%
	100% Pearson: Uncorrected chi2(6) = 71.5324 Design-based F(5.38, 672.40) = 5.2425 P=0.0001	
Access to Health Insurance		
Yes	51.26%	39.24%
No/Don't Know/Refused	4.44%	5.06%
	100% Pearson: Uncorrected chi2(1) = 16.1225 Design-based F(1, 125) = 7.8015 P=0.0060	
Parent Reported Adolescent Family Income**	$63,000	$40,000
	Median Regression Test: P = 0.000	
$0 - $24,999	2.45%	10.05%
$25,000 - $49,999	11.65%	15.28%
$50,000 - $74,999	20.02%	12.48%
$75,000 - $99,999	10.43%	4.13%
$100,000 - $149,000	7.83%	0.98%
$150,000 or more	4.43%	0.26%
	100% Pearson: Uncorrected chi2(5) = 625.0311 Design-based F(4.48, 559.68) = 64.9916 P=0.0000	

**Reflects n=3,823, college graduate observations with parent-reported income data for the unweighted survey sample as report of median is not available with the "survey" command

The mean age of continuing and first-generation college graduates is 28.69 and 28.89 years, respectively. Table 4.3 below compares first-generation college graduates to continuing generation college graduates by demographic characteristics. Similar to the overall college graduate sample, a greater percentage of first-generation and continuing generation college graduates are female than male, although first-generation college

graduates are slightly more female (57.2%) than continuing generation college graduates (53.35%). The racial composition of the first-generation college graduate population is 67.47% White, 13.63% Black, 2.78% Native American & Other, 4.78% Asian or Pacific Islander and 11.34% Hispanic, of all races. The percentage of first-generation college graduates who are Hispanic of all races is statistically significantly greater than the percent of continuing generation college graduates who are Hispanic of all races (11.34% to 4.38%, respectively; F(3.60, 450.57) = 10.0316, P=0.0000; Adjusted Wald test: F (1,125) = 13.59, Prob >F = 0.0003). First-generation and continuing generation college graduates share similar patterns in terms of proportion in household income categories, with the exception of household income of $150,000 or more. Almost double the proportion of continuing generation college graduates as compared to first-generation college graduates have a household income of $150,000 or more (10.89% to 5.53%, respectively). Approximately 90% of both the first-generation and continuing generation college graduates have some form of access to health insurance, but the difference in access between both groups is statistically significant. Last, median adolescent family household income, reported by parent/guardians of the respondents during Wave I of the survey in 1995, was statistically significantly different between the first-generation college graduates at $40,000 vs. the continuing college graduates at $63,000 (Median Regression Test: p= 0.00; based on the n=3,823, college graduate observations with parent-reported income data for the unweighted survey sample as report of median is not available with the "survey" command). Since approximately 19% of parent-reported household income data was not available (out of the weighted survey sample, n = 4,737) and there were statistically significant differences in mean adolescent household income

between the first-generation and continuing generation college graduates, multiple imputation methods for missing data were used in subsequent research questions involving multivariate analysis (regressions) and will be explained further later in the discussion. The missing data did not differ by first-generation status (Table 4.4).

Table 4.3. Characteristics of First-Generation College Graduates as Compared to Continuing College Graduates

	Continuing Generation n = 2,659				First-Generation n = 2,078			
Characteristics	**n**	**%**	**S.E.**	**95% CI**	**n**	**%**	**S.E.**	**95% CI**
Sex								
Male	1,124	46.65%	1.70	43.211-50.118	808	42.80%	1.70	39.522-46.140
Female	1,535	53.35%	1.70	49.882-56.789	1,270	57.20%	1.70	53.860-60.478
	2,659	**100%**			**2,078**	**100%**		
Race								
White	1,656	77.83%	2.90	71.619-82.997	1,092	67.47%	3.30	59.848-74.272
Black or African American	471	8.84%	2.20	5.641-13.590	387	13.63%	2.20	9.782-18.666
Native American & Other	81	2.67%	0.40	1.939-3.670	53	2.78%	0.70	1.692-4.526
Asian or Pacific Islander	297	6.28%	1.20	4.243-9.212	171	4.78%	1.20	2.912-7.742
Hispanic, all races*	154	4.38%	0.60	3.305-5.784	375	11.34%	2.10	7.872-16.077
	2,659	**100%**			**2,078**	**100%**		
Ethnicity								
Not Hispanic*	2,505	95.62%	0.60	9.422-9.669	1,703	88.66%	2.10	8.392-9.213
Hispanic	154	4.38%	0.60	3.305-5.784	375	11.34%	2.10	7.872-16.077
	2,659	**100%**			**2,078**	**100%**		
Current Household Income Before Taxes (2007/2008)								
$0 - $24,999	198	8.33%	0.90	6.646-10.402	111	6.79%	0.80	5.289-8.678
$25,000 - $49,999	524	19.18%	1.20	16.885-21.752	442	21.48%	1.40	18.816-24.417
$50,000 - $74,999	592	21.90%	1.40	19.272-24.766	537	26.95%	1.30	24.536-29.515
$75,000 - $99,999	483	18.45%	1.10	16.341-20.764	442	19.66%	1.30	17.264-22.308
$100,000 - $149,000	473	18.61%	1.30	16.201-21.286	335	15.63%	1.30	13.170-18.460
$150,000 or more*	310	10.89%	1.00	9.087-12.994	127	5.53%	0.80	4.183-7.283
Refused/Don't know	79	2.64%	0.40	1.929-3.599	84	3.94%	0.60	2.913-5.316
	2,659	**100%**			**2,078**	**100%**		
Access to Health Insurance								
Yes	2,448	92.02%	0.90	90.029-93.650	1,857	88.58%	0.90	86.640-90.272

No/Don't Know/Refused	211	7.97%	0.90	6.350-9.971	221	11.42%	0.90	9.728-13.360
	2,659	**100%**			**2,078**	**100%**		
Parent Reported Adolescent Family Income (1994/1995)**		$63,000				$40,000		
$0 - $24,999*	112	4.31%	0.80	2.979-6.207	398	23.28%	2.21	19.184-27.945
$25,000 - $49,999*	479	20.50%	1.50	17.694-23.627	572	35.38%	1.67	32.148-38.761
$50,000 - $74,999	686	35.24%	1.60	32.158-38.457	412	28.90%	2.19	24.770-33.404
$75,000 - $99,999*	396	18.35%	1.27	15.969-21.004	130	9.57%	1.23	7.388-12.302
$100,000 - $149,000*	276	13.79%	1.23	11.529-16.404	32	2.27%	0.51	1.450-3.531
$150,000 or more*	151	7.80%	1.56	5.218-11.512	15	0.61%	0.27	0.247-1.481
	2,100	**100%**			**1,559**	**100%**		

**Reflects n=3,823, college graduate observations with parent-reported income data for the unweighted survey sample as report of median is not available with the "survey" command

Table 4.4. Missing Parent-Reported Adolescent Family Income Data by College Graduate Generation Status

Characteristics	**Continuing Generation n=2,659**		**First-Generation n = 2,078**	
Not Missing	2,100	80.75%	1,559	77.19%
Missing	559	19.25%	519	22.81%
	Pearson: Uncorrected chi2(1) = 8.9655 Design-based F(1,125) = 3.2405 P=0.0743			

Table 4.5 takes a closer look at the college graduate sample in terms of racial composition by displaying college generation status within race among college graduates. Whites comprise the majority of the continuing generation and first-generation college graduate samples, 77.83% and 67.47%, respectively (Table 4.3 above). Among White college graduates, 40.81% are first-generation college graduates. Among Blacks, 55.07% of college graduates are first-generation college graduates (Table 4.5 below). In summary, within race among college graduates, a greater percentage of Whites, Native American & Others and Asian or Pacific Islanders are continuing generation college graduates while a greater percentage of Blacks and Hispanics of all races are first-generation college graduates.

Table 4.5. First-Generation College Graduate Status within Race among College Graduates

	Continuing Generation		**First-Generation**		**Total**	
White	1,656	59.19%	1,092	40.81%	**2,748**	**100%**
Black or African American	471	44.93%	387	55.07%	**858**	**100%**
Native American & Other	81	54.75%	53	45.25%	**134**	**100%**
Asian or Pacific Islander	297	62.3%	171	37.7%	**468**	**100%**
Hispanic, all races	154	32.69%	375	67.31%	**529**	**100%**
Total	**2,659**	**55.71%**	**2,078**	**44.29%**	**4,737**	**100%**

Table 4.6 displays adolescent family income within college graduate status and within race. The greatest percentage of Black and Hispanic, of all races first-generation college graduates come from families in the $0-$24,999 income category, while the majority of their White, Native American/Other and Asian or Pacific Islander first-generation counterparts come from families in the $25,000 - $49,999 range. Within all races of continuing generation college graduates except for Blacks, the majority come from families in the $50,000 - $74,999 range; the majority of Black continuing generation college graduates come from families in the $25,000 - $49,999 range.

Table 4.6. Parent-reported Adolescent Family Income* by First-Generation College Graduate Status and Race

	White		Black		Native American & Other		Asian or Pacific Islander		Hispanic, all races	
	CG	**FG**	**CG**	**FG**	**CG**	**FG**	**CG**	**FG**	**CG**	**FG**
$0 - $24,999	2.63%	15.62%	16.55%	47.51%	6.32%	18.11%	4.79%	35.59%	11.17%	41.63%
$25,000 - $49,999	18.58%	35.05%	32.11%	33.84%	36%	59.88%	21.24%	36.81%	24.80%	32.26%
$50,000 - $74,999	35.63%	33.39%	28.62%	15.98%	22.99%	16.31%	46.11%	22.47%	32.69%	20.73%
$75,000 - $99,999	19.52%	11.94%	17.03%	2.56%	7.05%	5.50%	10.97%	4.68%	15.62%	5.09%
$100,000 - $149,000	14.91%	3.15%	4.77%	0.11%	16.65%	0%	10.96%	4.21%	11.80%	0.27%
$150,000 or more	8.73%	0.85%	0.91%	0%	10.99%	0.20%	5.94%	0%	3.92%	0.03%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

*Based on survey-adjusted data, n = 3,659 college graduates with parent-reported data available
CG = Continuing Generation College Graduates
FG = First-Generation College Graduate

Results from the univariate analysis indicated potential differences in the college graduate sample, stratified by first-generation status. The demographic characteristics that indicated differences were: race, ethnicity, current household income, access to health insurance and parent-reported adolescent family income. Race, current household income and adolescent family income were dichotomized to have the following responses: (race: 0 = White, 1 = Non White; current household income: 0 = ≥$50,000, 1 = <$50,000 and; adolescent family income: 0 = ≥$50,000, 1 = <$50,000). Logistic regression analysis was used to investigate the likelihood of being a first-generation college graduate and exhibiting the five characteristics, individually.

Among the college graduate sample, in terms of race, first-generation college graduates were 1.6 times more likely to be of a minority group than their continuing generation peers (OR: 1.69, 95% CI:1.27, 2.25) and, this result was statistically significant (p = 0.000). First-generation college graduates were 2.79 times more likely to be Hispanic than continuing generation college graduates (OR: 2.79, 95% CI: 1.89, 4.13) and, this result was statistically significant (p = 0.000). First-generation college graduates

were approximately equally as likely as their continuing generation peers to have a current household income of below $50,000 (OR: 1.06, 95% CI: 0.87, 1.29). For access to health insurance, first-generation college graduates were less likely to have access to health insurance (OR: 0.67, 95% CI: 0.50-0.89) and this result was statistically significant (p=0.006). Lastly, first-generation college graduates were 3.91 times more likely to come from a family with an income below the median for the college graduate sample ($51,000 for unweighted college sample) than their continuing generation peers (OR: 3.91, 95% CI: 2.97, 5.15) and this result was statistically significant (p = 0.000).

4C. Univariate Analysis of Outcome and Mediator Variables

Table 4.7 below displays the descriptive statistics of the BMI variable for the college graduate sample, n = 4,656. The mean BMI is 27.42 (SD = 0.20, CI 95% [27.01-27.82]).

Table 4.7. Univariate Analysis of Health: BMI (Continuous) among College Graduates

BMI	n	Mean	SD	95% Confidence Interval
	4,656	27.42	0.20	27.01-27.82

Table 4.8 displays the frequency of BMI category among college graduates. The majority of college graduates (39.47%) are in the normal range which represents a BMI of 18.5 – 24.9.

Table 4.8. Univariate Analysis of Health: BMI (Category) among College Graduates

BMI Category	Frequency Count (n)	Frequency %
Underweight: <18.5	71	1.48%
Normal: 18.5 >25	1,845	39.47%
Overweight: 25>30	1,486	32.37%
Obese 30+	1,254	26.69%
Total	**4,656**	**100%**

Figure 4.1 is a graphical representation of the distribution of BMI among the college graduate sample; the distribution appears to be close to normal (Skewness = 1.54;

note these statistics are based on the available BMI data for the unweighted college graduate sample since the skewness statistics were not supported by the "survey" command).

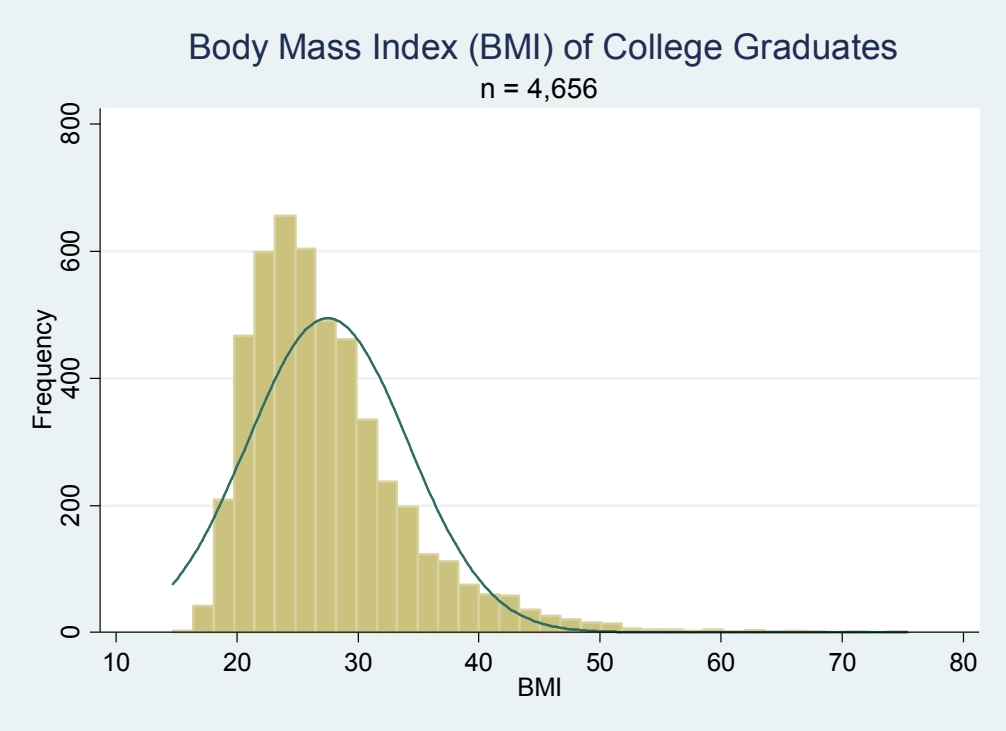


Figure 4.1. Distribution of BMI of College Graduates

Table 4.9 below displays the mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) measurements for the college graduate sample. They are 123.5 and 78.35, respectively. Table 4.10 below describes the frequency of blood pressure classifications among the college graduate sample. The majority of college graduates (n = 2,083 or 45.64%) have a blood pressure classified in the "Prehypertension" category; that is a systolic pressure of 120-139 or diastolic pressure of 80-89. Figure 4.2 and 4.3 below are graphical representations of the distribution of each of the numeric measures of blood pressure among the college graduate sample. The distribution for each measure is normal (SBP Skewness = 0.463, Kurtosis = 3.715; DBP Skewness = 0.508, Kurtosis = 4.163).

Table 4.9. Univariate Analysis of Health: Blood Pressure among College Graduates

Blood Pressure Measures	n	Mean	SD	95% Confidence Interval
Systolic	4,576	123.50	0.36	122.80-124.20
Diastolic	4,576	78.35	0.24	77.87-78.82

Table 4.10. Univariate Analysis of Health: Blood Pressure (Category) among College Graduates

Blood Pressure	Frequency Count (n)	Frequency %
Normal	1799	37.61%
Prehypertension	2083	45.64%
Hypertension	694	16.75%
Total	**4,576**	**100%**

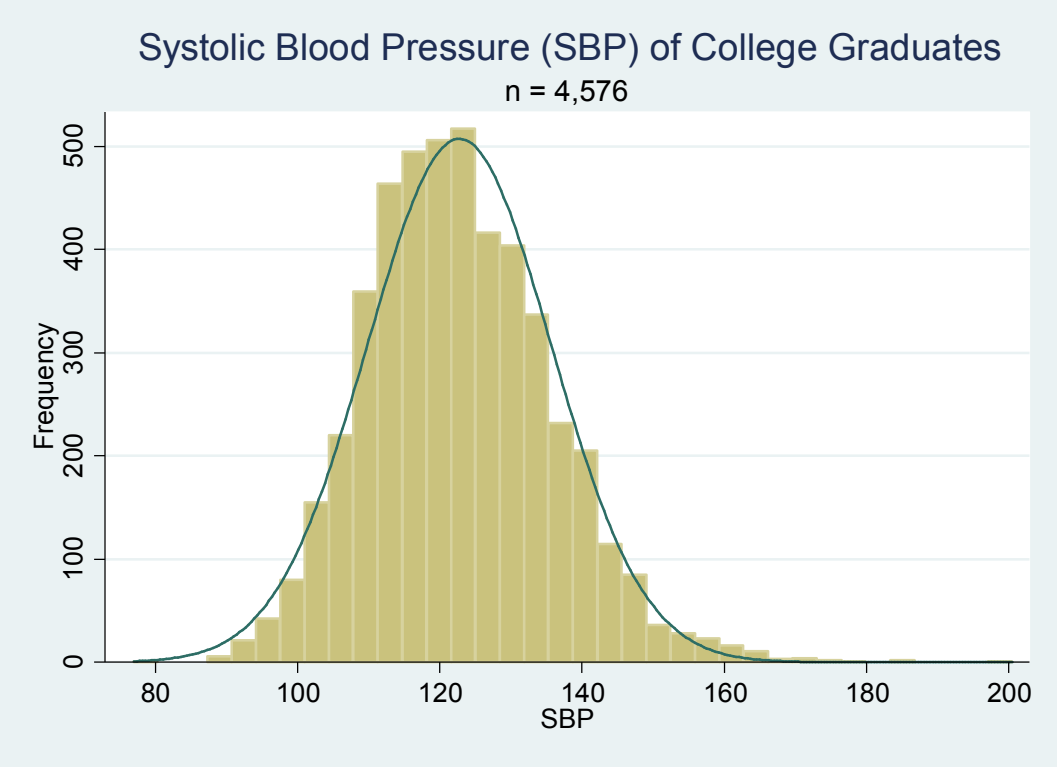


Figure 4.2. Systolic Blood Pressure of College Graduates

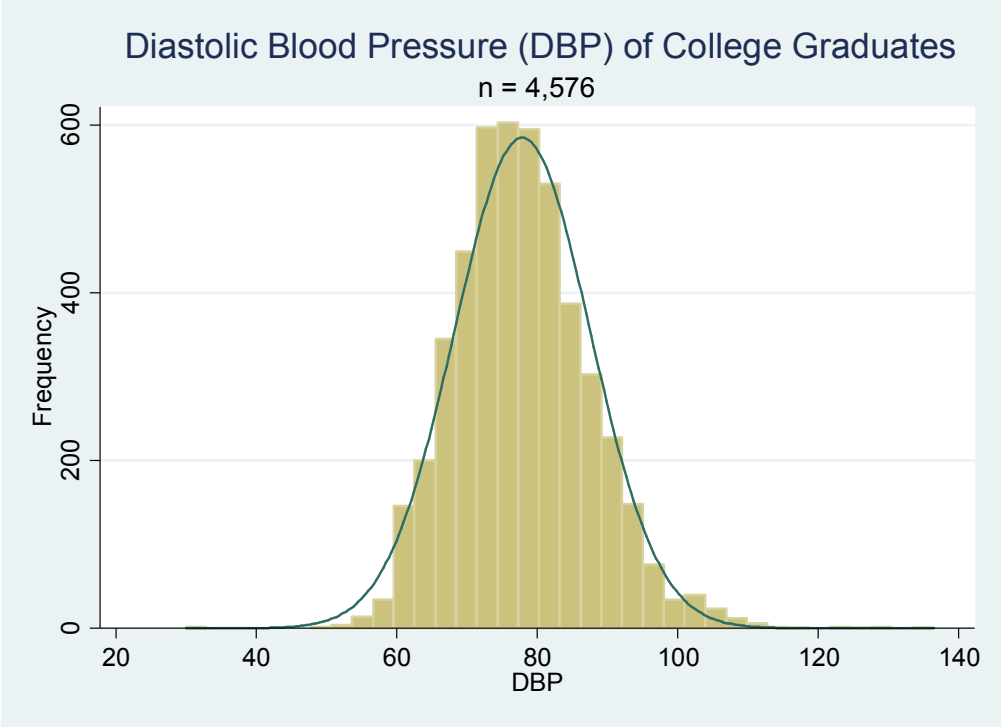


Figure 4.3. Diastolic Blood Pressure of College Graduates

Table 4.11 below describes the medians for numeric, potential health behavior mediator variables among the college graduate sample. The median college graduate participation in moderate-to-vigorous physical activities in the past week was 6.00 activities, the median fast food consumption was 1.00 time, and median sugar-sweetened beverage consumption was 5.00 times. The figures (4.4 – 4.6) below display the distribution of the physical activity, fast food and sugar-sweetened beverage variables. The distributions are non-normal and positively-skewed. Because these three numeric variables are non-normal and positively-skewed, they were dichotomized to represent participation or consumption above or below the median for each variable (Table 4.12). For example, for the dichotomized physical activity variable, 0 = participated in below the median number (6.00) of moderate-to-vigorous physical activities for college graduates in the past week and 1 = participated in the median number or more moderate-to-vigorous physical activities for college graduates in the past week.

Table 4.11. Univariate Analysis of Potential Health Behavior Mediators among College Graduates (Dichotomized)

Selected Health Behaviors	n*	Median	Mean	SD	Min-Max
Physical Activity	4,950	6.00	6.74	5.68	0 – 46
Fast-food Consumption	4,950	1.00	1.81	2.71	0 – 99
Sugar-sweetened Beverage Consumption	4,949	5.00	7.59	9.11	0 – 99

*Based on full unweighted college graduate sample since "survey" command does not support median estimate

Table 4.12 Univariate Analysis of Potential Health Behavior Mediators among College Graduates (Dichotomized)

Selected Health Behaviors	Frequency Count (n)*	Frequency %
Physical Activity		
≥median(6.00)	2,432	53.4%
<median (6.00)	2,305	46.6%
Fast-food Consumption		
>median (1.00)	1,952	39.2%
≤median (1.00)	2,785	60.8%
Sugar-sweetened Beverage Consumption		
>median (5.00)	2,213	46.41%
≤median (5.00)	2,524	53.59%

*Weighted survey sample n = 4,737

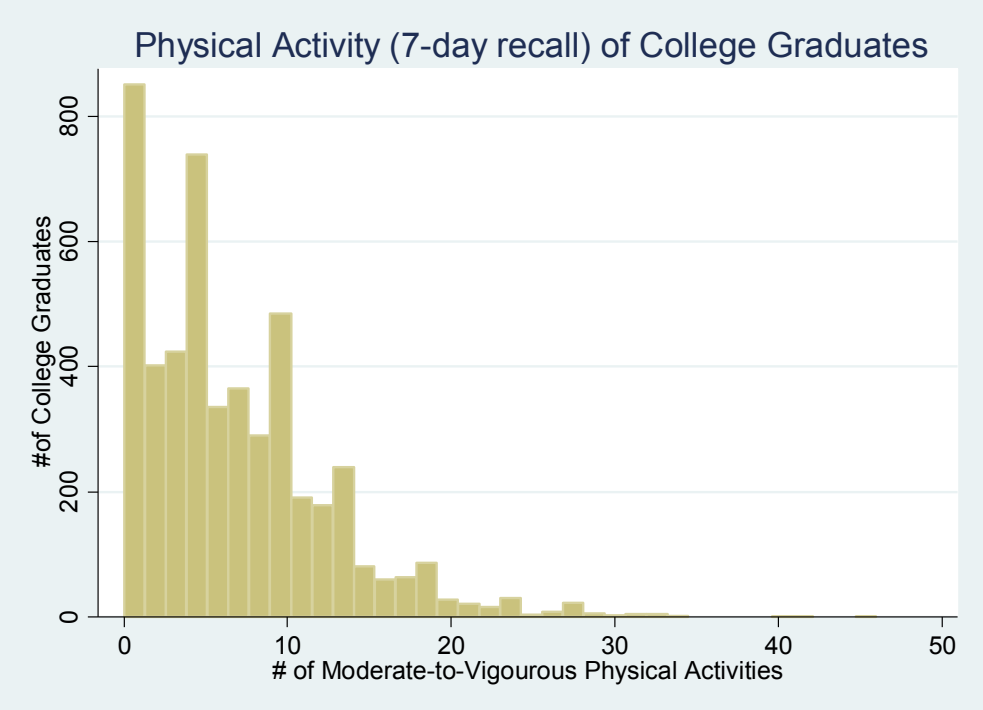


Figure 4.4. Physical Activity of College Graduates (Continuous)

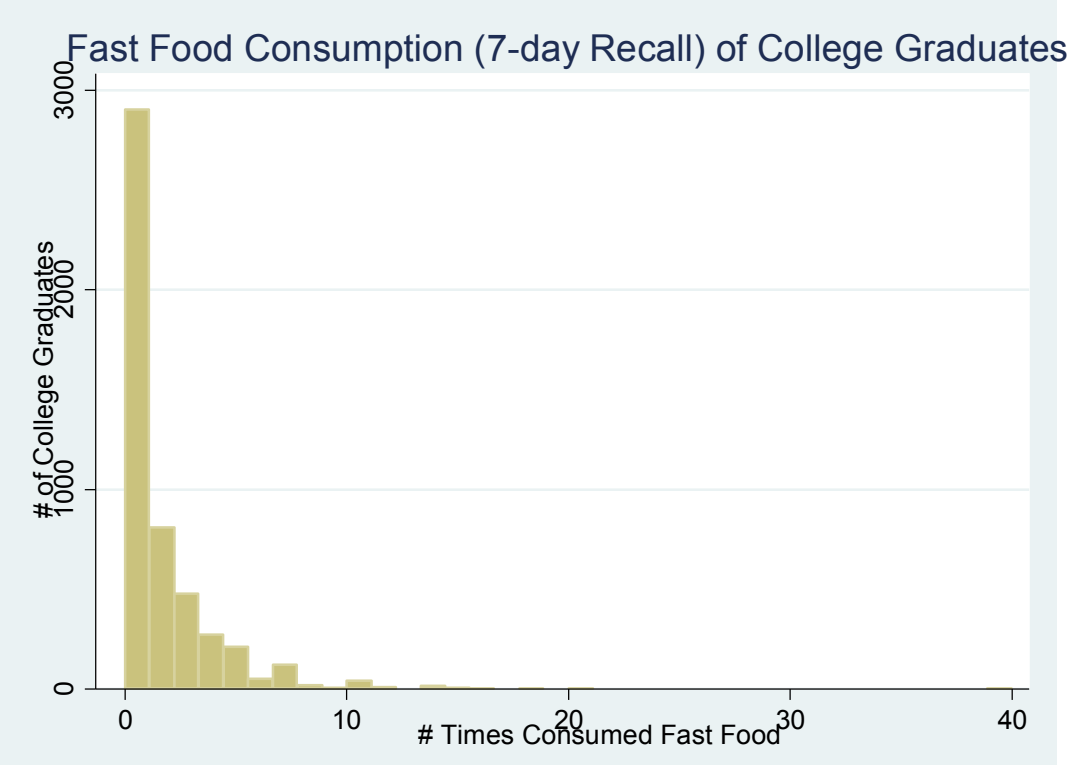


Figure 4.5. Fast Food Consumption of College Graduates

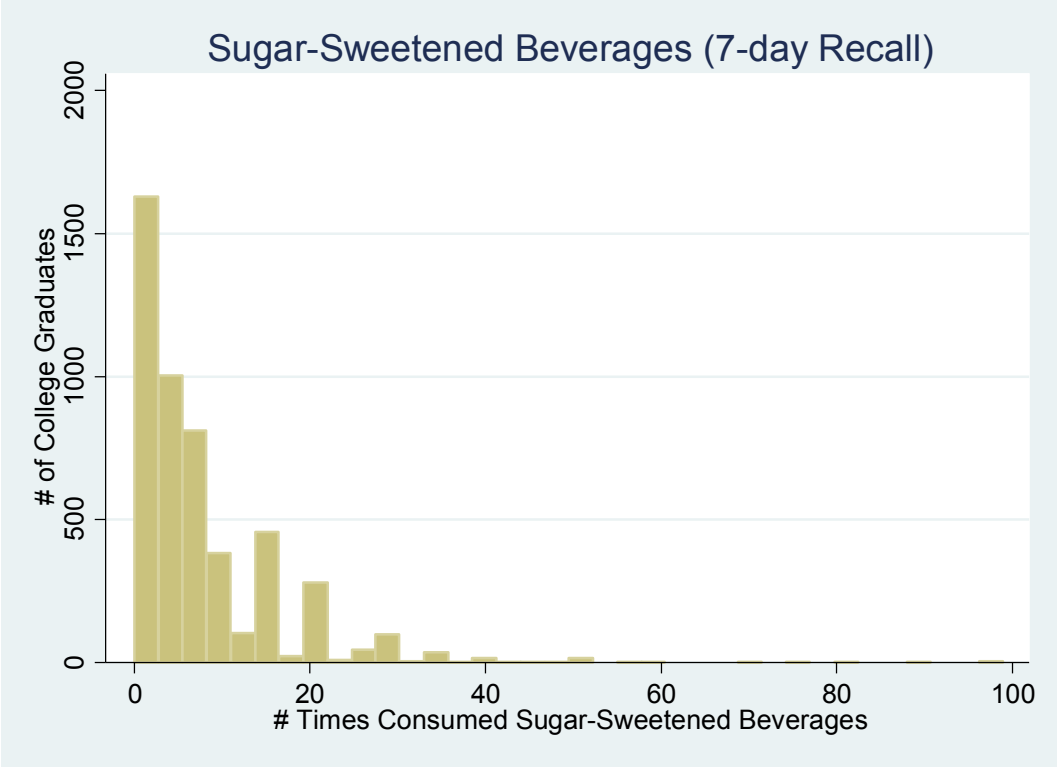


Figure 4.6. Sugar-Sweetened Beverage Consumption of College Graduates

Table 4.13 below describes the frequency of having ever smoked regularly among college graduates. A majority of college graduates reported not having ever smoked regularly (n = 3,488 or 69.36%).

Table 4.13. Univariate Analysis of Potential Smoking Mediator among College Graduates

Health Behavior: Ever Smoked	Frequency Count (n)	Frequency %
No	3,488	69.36%
Yes	1,248	30.64%
Total	**4,736**	**100%**

Table 4.14 below describes the mean frequency of stress experienced by college graduates as measured by a summed scale of 5 items (0 = never to 4 = very often). On average, college graduates reported "almost never," being able or confident to handle certain life situations in the past 30 days. Figure 4.7 below is a graph of the reported frequency of stress experienced by college graduates; the distribution of the unstandardized mean is normal.

Table 4.14. Univariate Analysis of Potential Stress Mediator among College Graduates

Stress	n	Mean	SD	95% Confidence Interval
Mean Stress Frequency	4,736	1.01	.014	.982 – 1.038

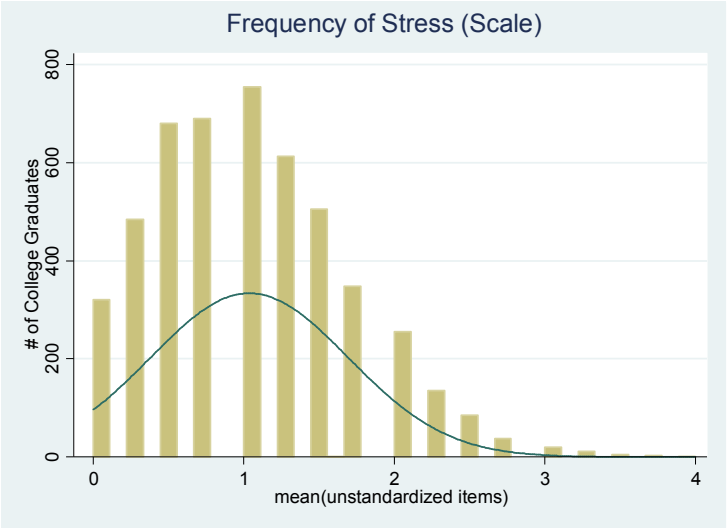


Figure 4.7. Frequency of Stress Among College Graduates

Table 4.15 describes the frequency of college graduates receipt and provision of instrumental support from and to their parents. A little over one quarter of college graduates (n = 1,194, 26.16%) have not ever received any financial gifts or loans from parents, in-laws, or relatives to help buy, remodel, build or furnish a home or condominium. A smaller percentage of college graduates, 19.15%, reported having provided their mother or mother figure with living expenses of more than $50 to pay living expenses during the past 12 months. Approximately one tenth (10.21%) of college graduates reported having provided their father of father figure with living expenses or given more than $50 to pay living expenses during the past 12 months.

Table 4.15. Univariate Analysis of Potential Social Support Mediators among College Graduates

Social Support	Frequency Count (n)	Frequency %
Instrumental support received		
No	3,534	73.84
Yes	1,194	26.16
Total	**4,728**	**100%**
Instrumental support provided (Mother/Mother Figure)		
No	3,530	80.85%
Yes	1,029	19.15%
Total	**4,559**	**100%**
Instrumental support provided (Father/Father Figure)		
No	3,658	89.79%
Yes	496	10.21%
Total	**4,154**	**100%**

4D. Bivariate Analysis of Outcome and Mediator Variables

4D1. BMI

Table 4.16 shows the mean BMI of first and continuing generation college graduates. The mean Body Mass Index (BMI) among first-generation college graduates as compared to continuing generation college graduates was nearly 2 points higher at

28.41 vs. 26.62. This difference was statistically significantly different at the 95% confidence interval according to an Adjusted Wald Test (F(1,125)=39.21, Prob >F = 0.0000). Graphical distributions of BMI for first and continuing generation college graduates are displayed in Appendix 1.

Table 4.16. Mean BMI by College Generation Status

	Mean	**Std. Err.**	**95% Conf. Interval**
Continuing Generation College Graduates	26.62	0.23	26.18 – 27.07
First-Generation College Graduates	28.41	0.24	27.95 – 28.88
Adjusted Wald Test: F(1,125)=39.21, Prob >F = 0.0000			

Table 4.17 shows the proportion of first and continuing generation college graduates by categorical BMI (underweight, normal, overweight and obese). Among continuing generation college graduates, 45% are in the normal weight category as compared to 33% among first-generation college graduates. The difference in these proportions is statistically significantly different at the 95% confidence interval when compared to each other. A greater proportion of first-generation college graduates are in the "Obese I" (17.28%) and "Obese III" (6.78%) categories than continuing generation college graduates in those categories (13.25 and 3.48%, respectively).

Table 4.17. BMI (Category) of First-Generation College Graduates as Compared to Continuing College Graduates (%)**

BMI category	Continuing Generation College Graduates	First-Generation College Graduates	Total
Underweight: <18.5	59.28%	40.72%	**100%**
	1.57%	1.357%	1.475%
	43	28	71
Normal: 18.5-<25*	62.96%	37.04%	100%
	44.59%	33.02%	39.47%
	1142	703	1845
Overweight: 25-<30	54.61%	45.39%	100%
	31.72%	33.18%	32.37%
	826	660	1486
Obese: 30+*	46.2%	53.8%	100%
	22.13%	32.44%	26.69%
	602	652	1254
Total	55.73%	44.27%	100%
	100%	100%	100%
	2613	2043	4656
Pearson: Uncorrected chi2(3) = 85.8175 Design-based F(2.77, 346.28) = 14.9737 P=0.0000			

Key: row percentages
column percentages
number of observations

** Height/weight data incomplete, missing or invalid 81cases of weighted sample (46 and 35, continuing and first-generation college graduates, respectively - Adjusted Wald test: F(1,42) = 0.24, Prob>F = 0.6249)

4D2. Blood Pressure

The mean systolic blood pressure for first-generation college graduates is slightly higher than that for continuing generation college graduates, but the difference is not statistically significant as indicated by an Adjusted Wald test (Mean=124.02, SD .568, 95% CI [122.896, 125.143] and Mean=123.083, SD .341, 95% CI [122.409, 123.7580], respectively (Table 4.18). The mean diastolic blood pressure for first-generation college graduates is slightly higher than that for continuing generation college graduates, but the difference is not significant, also indicated by an Adjusted Wald test (Table 4.19).

Table 4.18. Systolic Blood Pressure by College Generation Status*

	Mean	Std. Err.	95% Conf. Interval
Continuing Generation College Graduates	123.08	0.34	122.41 – 123.76
First-Generation College Graduates	124.02	0.57	122.90 – 125.14
Adjusted Wald Test: F(1,125) = 2.64, Prob>F = 0.10065			

*Blood pressure measurements missing or invalid for 161 cases

Table 4.19. Diastolic Blood Pressure by College Generation Status*

	Mean	Std. Err.	95% Conf. Interval
Continuing Generation College Graduates	78.07	0.28	77.51 – 78.62
First-Generation College Graduates	78.70	0.33	77.05 – 79.36
Adjusted Wald Test: F(1,125) = 2.76, Prob>F = 0.0991			

*Blood pressure measurements missing or invalid for 161 cases of weighted sample

Table 4.20 shows the proportion of first and continuing generation college graduates by categorical blood pressure (normal = 0 and prehypertension, hypertension I and hypertension II = 1). While a greater proportion of first-generation college graduates are in the hypertensive categories as compared to the continuing generation college graduates, the difference is not significant according to a chi-square test (P=0.1681).

Table 4.20. Blood Pressure Category of College Graduates by Generation Status

Blood Pressure Category	**Continuing Generation College Graduates**	**First-Generation College Graduates**	**Total**
Normal: systolic <120, diastolic <80	57.34%	42.66%	100%
	38.8%	36.12%	37.61%
	1026	773	1799
Prehypertension: systolic 120-139 or diastolic 80-89	54.52%	45.48%	100%
	61.20%	63.88%	62.39%
	1538	1239	2777
Total	55.58%	44.42%	100%
	100%	100%	100%
	2564	2012	4576
Pearson: Uncorrected chi2(1) = 3.4635 Design-based F(1, 125) = 1.9217 P=0.1681			

*Blood pressure measurements missing or invalid for 161 cases of weighted sample

The mean systolic blood pressure for first-generation college graduates is slightly higher than that for continuing generation college graduates but the difference is not statistically significant as indicated by an Adjusted Wald test (Mean=124.02, SD .568, 95% CI [122.896, 125.143] and Mean=123.083, SD .341, 95% CI [122.409, 123.7580], respectively. The mean diastolic blood pressure for first-generation college graduates is slightly higher than that for continuing generation college graduates but the difference is not significant, also indicated by an Adjusted Wald test. The distributions of numeric blood pressures are normal for both continuing and first-generation college graduates (See Appendix 2 and 3).

4D3. Bivariate Analysis of Mediator Variables

4D3a. Physical Activity

Table 4.21 displays the median and mean of the summed seven moderate-to-vigorous physical activities that respondents were asked if they participated in for the week. The mean participation in physical activity did not differ significantly between first-generation and continuing generation college graduates. The distributions are positively-skewed for both continuing and first-generation college graduates (See Appendix 4). This is a summed variable of seven items, as used in previous research (McCullough & Marks, 2014), (Andersen et al., 1998). The variable was dichotomized by median split when testing the hypotheses for the current study (Table 4.22).

Table 4.21. Median and Mean for Physical Activity by College Generation Status

	Median*	**Mean**	**Std. Err.**	**95% Conf. Interval**
Continuing Generation College Graduates	6.00	7.19	0.16	6.87-7.50
First-Generation College Graduates	5.00	6.76	0.19	6.39-7.14
Adjusted Wald Test: F(1,125) = 3.47, Prob > F = 0.0650				

*Based on unweighted college graduate sample since "survey" command does not support median estimate

Table 4.22. Physical Activity (Dichotomized) by College Generation Status

Physical Activity Category	Continuing Generation College Graduates	First-Generation College Graduates
≥median(6.00)	56.16%	49.93%
<median (6.00)	43.84%	50.07%
Total	**100%**	**100%**
Pearson: Uncorrected chi2(1) = 18.2327 Design-based F(1,125) = 10.3235, P = 0.0017		

4D3b. Fast Food Consumption

Table 4.23 displays the median and mean number of times college graduates reported eating fast food in the past seven days. First-generation college graduates reported consuming fast food approximately two times in the past week while continuing generation college graduates reported consuming fast food approximately 1.5 times in the past week. The mean for first-generation college graduates is statistically significantly unequal, and greater according to an Adjusted Wald test. The distributions are positively-skewed for both continuing and first-generation college graduates (See Appendix 5). The variable was dichotomized by median split when testing the hypotheses for the current study (Table 4.24).

Table 4.23. Median and Mean for Fast Food Consumption by College Generation Status**

	Median*	Mean	Std. Err.	95% Conf. Interval
Continuing Generation College Graduates	1.00	1.48	0.08	1.31-1.64
First-Generation College Graduates	1.00	1.90	0.08	1.75-2.06
Adjusted Wald test F(1,125) = 20.46, Prob > F = 0.0000				

*Based on unweighted graduate sample since "survey" command does not support median estimate
**1 outlier with response "99" removed

Table 4.24. Fast Food Consumption (Dichotomized) by College Generation Status

Fast Food Consumption	Continuing Generation College Graduates	First-Generation College Graduates
>median (1.00)	34.33%	45.34%
≤median (1.00)	65.67%	54.66%
Total	**100%**	**100%**
Pearson: Uncorrected chi2(1) = 59.5033 Design-based F(1,125) = 25.4273, P = 0.0000		

4D3c. Sugar-sweetened Beverage Consumption

Similar to Table 4.23, Table 4.25 displays the median and mean number of sugar-sweetened beverages college graduates reported consuming in the past week. First-generation college graduates reported consuming a statistically significantly, unequal (according to a Wald test), higher number of sugar-sweetened beverages (8.30) than their continuing generation peers (6.90). The distributions are positively-skewed for both continuing and first-generation college graduates (See Appendix 6). The variable was dichotomized by median split when testing the hypotheses for the current study (Table 4.26).

Table 4.25. Median and Mean Sugar-Sweetened Beverage Consumption by College Generation Status

	Median*	Mean	Std. Err.	95% Conf. Interval
Continuing Generation College Graduates	5.00	6.90	0.25	6.39-7.40
First-Generation College Graduates	5.00	8.30	0.24	7.81-8.78
Adjusted Wald test F(1,125) = 15.95, Prob > F = 0.0001				

*Based on full college graduate sample not adjusted for survey design since "survey" command does not support median estimate

Table 4.26 Sugar-Sweetened Beverage Consumption (Dichotomized) by College Generation Status

Sugar-Sweetened Beverage Consumption	Continuing Generation College Graduates	First-Generation College Graduates
<median (5.00)	44.75%	48.48%
≥median (5.00)	55.25%	51.52%
Total	**100%**	**100%**
Pearson: Uncorrected chi2(1) = 6.5450 Design-based F(1,125) = 3.2526, P = 0.0737		

4D2d. Smoking

Table 4.27 displays the percentages of college graduates, by generation status that reported having ever smoked regularly in their lifetime. The percentages of college graduates in each category are similar with just a slightly larger percentage of continuing generation college graduates reporting having ever smoked regularly.

Table 4.27. History of Smoking by Generation Status (%)

History of Smoking	Continuing Generation College Graduates	First-Generation College Graduates
No	68.17%	70.86%
Yes	31.83%	29.14%
Total	**100%**	**100%**
Pearson: Uncorrected chi2(1) = 3.98 Design-based F(1, 125) = 1.55 P=0.22		

4D3e. Stress

Table 4.28 shows the mean of the constructed stress scale (mean of sum of five stress items). The reported frequency with which college graduates experienced stress (0 = Never to 4 = Very often) was slightly higher among similar first-generation college graduates as compared to continuing generation college graduates, but the difference was not significant. A graphic representation of the distribution of frequency of stress for the first and continuing generation sup-populations is found in Appendix 7.

Table 4.28. Mean Stress Scale Score (α = 0.73) by College Generation Status

	Mean	Std. Err.	95% Conf. Interval
Continuing Generation College Graduates	1.00	0.02	0.96-1.03
First-Generation College Graduates	1.03	0.02	0.99-1.07
Adjusted Wald Test: F(1,125) = 1.42, Prob > F = 0.2360			

4D3f. Receipt of Social Support

Table 4.29 displays the percent of college graduates that report themselves or their spouse having ever received financial gifts or loans from parents, in-laws, or relatives to help buy, remodel, build or furnish a home or condominium. A statistically significantly greater portion of continuing generation college graduates (30.19%) as compared to first-generation college graduates (21.07%) reported having ever received this type of instrumental support according to a chi-squared test (Design-based F(1, 125) = 22.3776, P=0.0000). A figure displaying the percent of first and continuing generation sup-populations that have received financial gifts or loans from their parents in the last 12 months is in Appendix 8.

Table 4.29. Instrumental Support Received by Generation Status (%)

Instrumental Support Received	Continuing Generation College Graduates	First-Generation College Graduates
No	69.81%	78.93%
Yes	30.19%	21.07%
Total	100%	100%
Pearson: Uncorrected chi2(1) = 50.3052 Design-based F(1, 125) = 22.3776, P=0.0000		

4D2g. Provision of Social Support to Mother/Mother Figure

Table 4.30 displays college graduates by percent having provided financial support to their mother/mother figure in the past 12 months. A statistically significantly greater percentage of continuing generation college graduates 86.11% as compared to

74.08% of first-generation college graduates reported never paying for their mother's living expenses or having provided at least $50 towards their mother's living expenses over the last 12 months according to a chi-squared test (Design-based F(1, 124) = 33.3535, P=0.0000). A figure displaying the first and continuing generation sup-populations that have provided financial support for living expenses to their mother/mother figures is in Appendix 9.

Table 4.30. Instrumental Support Provided to Mother/Mother Figure by College Generation Status

Instrumental Support Provided to Mother	Continuing Generation College Graduates	First-Generation College Graduates
No	86.11%	74.08%
Yes	13.89%	25.92%
Total	100%	100%
Pearson: Uncorrected chi2(1) = 104.72 Design-based F(1, 124) = 33.3535, P=0.0000		

4D2h. Provision of Social Support to Father/Father Figure

Table 4.31 displays college graduates by percent having provided financial support to their father/father figure in the past 12 months. A greater percentage of continuing generation college graduates 92.08% vs. 86.64% of first-generation college graduates reported never paying for their father's living expenses or having provided at least $50 towards their father's living expenses over the last 12 months. A graph of first and continuing generation sub-populations that have provided financial support for living expenses to their father/father figures is in Appendix 10.

Table 4.31. Instrumental Support Provided to Father/Father Figure by College Generation Status

Instrumental Support Provided to Father	Continuing Generation College Graduates	First-Generation College Graduates
No	92.08%	86.64%
Yes	7.915%	13.36%
Total	100%	100%
Pearson: Uncorrected chi2(1) = 32.72 Design-based F(1, 124) = 8.7715 P=0.0037		

4E. Test of Hypotheses

4E1. Hypothesis 1: First-Generation Status and Outcome Variables

The following hypotheses investigate the relationship between first-generation status and health (BMI and blood pressure). This is the first step of a mediation analysis to establish significance (if any) between the main independent variable and the outcome variable.

Hypothesis 1a: First-generation college status will be associated with increased BMI among college graduates.

The mean Body Mass Index (BMI) among first-generation college graduates as compared to continuing generation college graduates was nearly 2 points higher at 28.41 vs. 26.62 (Table 4.32). This difference was statistically significantly different at the 95% confidence interval according to an Adjusted Wald Test (F (1,125) = 39.21, Prob >F = 0.0000). A linear regression was calculated to predict BMI based on first-generation college graduate status. A significant regression equation was found (F (1,125) = 39.21, Prob > F = 0.0000) with an R-squared of 0.0191. Participants' predicted BMI was equal to 26.62 + 1.79 when first-generation college graduate status was measured dichotomously (0 = Continuing generation college graduate and 1 = First-generation

college graduate). BMI increased 1.79 units for first-generation as compared to continuing generation college graduates.

Table 4.32. Linear Regression of BMI by College Generation Status

BMI	Coefficient	S.E.	t-test	p-value
First-Generation Status	1.79	0.29	6.26	0.000
Constant	26.62	0.23	117.75	0.000
Design df = 125, F(1,125) = 39.21, Prob > F = 0.0000, R-squared = 0.0191				

Table 4.33 displays the results of a logistic regression model testing the significance of first-generation status on BMI. The results are similar to those of the analysis of first-generation status and numeric BMI in terms of significance of that status to BMI. The results of this analysis indicate that first-generation college graduates are 1.64 times as likely as their continuing generation peers to be overweight or obese (p = 0.000). This result is statistically significant.

Table 4.33. Overweight and First-Generation Status

Overweight	Odds Ratio	S.E.	t	p-value	Confidence Interval
First-Generation	1.64	0.15	5.42	0.000	1.367-1.959
Constant	1.17	0.96	1.87	0.064	0.991-1.374
Design df = 125, F(1,125) = 29.35, Prob > F = 0.0000					

Hypothesis 1b: First-generation college status will be associated with increased likelihood of prehypertension/hypertension.

Table 4.34 displays the results of a logistic regression model testing the significance of first-generation status on blood pressure. The results of this analysis indicate that first-generation college graduates are 1.12 times as likely as their continuing generation peers to be prehypertensive or hypertensive, but that likelihood is not statistically significantly different.

Table 4.34. Blood Pressure of College Graduates by Generation Status

Pre or hypertensive	Odds Ratio	S.E.	t	p-value	Confidence Interval
First-Generation	1.12	0.09	1.39	0.168	0.952-1.32
Constant	1.58	0.08	8.68	0.000	1.42 – 1.75
Design df = 125, F(1,125) = 1.92, Prob > F = 0.1682					

4E2. Hypothesis 2: Potential Mediators and First-Generation Status

The following hypotheses investigate potential mediators such as health behaviors, stress and social support, comparing means and proportions between first-generation college graduates as compared to continuing generation college graduates. This is the second step of a mediation analysis to establish significance (if any) between a potential mediator and an outcome variable.

Hypothesis 2a1: Participation in physical activity will differ by first-generation college graduate status among college graduates.

Table 4.35 displays the results of a logistic regression model testing the significance of first-generation status on physical activity. The results of this analysis indicate that first-generation college graduates are 22% less likely than their continuing generation peers to participate at the median or greater level of physical activity for college graduates and that difference is statistically significant.

Table 4.35. Physical Activity by College Generation Status

Physical Activity (Median and above)	Odds Ratio	S.E.	t	p-value	Confidence Interval
First-Generation	0.78	0.06	-3.21	0.002	0.667-0.908
Constant	1.28	0.08	4.02	0.000	1.135-1.447
Design df = 125, F(1,125) = 10.31, Prob > F = 0.0017					

Hypothesis 2a2: Fast food consumption will differ by first-generation college graduate status among college graduates.

Table 4.36 displays the results of a logistic regression model testing the significance of first-generation status on fast food consumption. The results of this analysis indicate that first-generation college graduates are 1.6 times as likely as their continuing generation peers to consume fast food at a greater level than the median of college graduates, and that difference is statistically significant.

Table 4.36. Fast Food Consumption by College Generation Status

Fast Food Consumption (Above median)	Odds Ratio	S.E.	t	p-value	Confidence Interval
First-Generation	1.59	0.146	5.03	0.000	1.323-1.903
Constant	0.523	0.042	-8.13	0.000	0.446-0.612
Design df = 125, F(1,125) = 25.30, Prob > F = 0.0000					

*1 outlier with response "99" removed

Hypothesis 2a3: Sugar-sweetened beverage consumption will differ by first-generation college graduate status among college graduates.

Table 4.37 displays the results of a logistic regression model testing the significance of first-generation status on sugar-sweetened beverage consumption. The results of this analysis indicate that first-generation college graduates are 1.2 times more likely than their continuing generation peers to consume sugar-sweetened beverages at a greater level than the median for college graduates, and that difference is not statistically significant.

Table 4.37. Sugar-Sweetened Beverage Consumption by College Generation Status

Sugar-sweetened beverages (Above Median)	Odds Ratio	S.E.	t	p-value	Confidence Interval
First-Generation	1.16	0.10	1.80	0.074	0.985-1.370
Constant	0.81	0.04	-3.93	0.000	0.729-0.901
Design df = 125, F(1,125) = 3.25, Prob > F = 0.0738					

*1 outlier with response "99" removed

Hypothesis 2a4: Smoking will not differ by first-generation status among college graduates.

Table 4.38 displays the results of a logistic regression model testing the significance of first-generation status on ever smoking regularly. The results of this analysis indicate that first-generation college graduates are 12% less likely than their continuing generation peers to have smoked regularly, but that likelihood is not statistically significantly different.

Table 4.38. History of Smoking by Generation Status

History of Smoking	Odds Ratio	S.E.	t	p-value	Confidence Interval
First-Generation	0.88	0.09	-1.24	0.216	0.72 -1.08
Constant	0.47	0.04	-9.00	0.000	0.40 – 0.55
Design df = 125, F(1,125) = 1.55, Prob > F = 0.2157					

Hypothesis 2b: First-generation status will be associated with higher reported stress.

Table 4.39 shows a linear regression of first-generation status on the constructed stress scale (mean of sum of five stress items). The level of stress college graduates experienced (0 = never to 4 = very often) did not differ for first-generation college graduates as compared to continuing generation college graduates.

Table 4.39. First-Generation Status and Stress

	Coefficient	S.E.	t-test	p-value
Stress	0.03	0.03	1.19	0.236
Constant	1.00	0.02	57.09	0.000
Design df = 125, F(1,125) = 1.42, Prob > F = 0.2360, R-squared = 0.0006				

Hypothesis 2c1: First-generation status will be significantly associated with lower likelihood of receipt of instrumental family support among college graduates.

Table 4.40 displays the odds of college graduates reporting themselves or their spouse having ever received financial gifts or loans from parents, in-laws, or relatives to

help buy, remodel, build or furnish a home or condominium. The results of this analysis indicate that first-generation college graduates are 38% less likely than their continuing generation peers to have received instrumental support from their parent or relatives and that likelihood is statistically significantly different (p = 0.000).

Table 4.40. Instrumental Support Received by Generation Status

Instrumental Support Received	Odds Ratio	S.E.	t	p-value	Confidence Interval
First-Generation	0.62	0.06	-4.71	0.000	0.504 – 0.76
Constant	0.43	0.03	-11.82	0.000	0.38 – 0.50
Design df = 125, F(1,125) = 22.18, Prob > F = 0.0000					

Hypothesis 2c2: First-generation status will be associated with higher likelihood of provision of instrumental support to a mother/mother figure among college graduates.

Table 4.41 displays the odds of college graduates reporting having provided financial support to their mother/mother figure in the past 12 months. The results of this analysis indicate that first-generation college graduates are 2.18 times as likely as their continuing generation peers to have paid for their mother's living expenses or have provided at least $50 towards their mother's living expenses over the last 12 months (p = 0.000).

Table 4.41. Instrumental Support Provided to Mother/ Mother Figure by College Generation Status

Instrumental Support Provided to Mother	Odds Ratio	S.E.	t	p-value	Confidence Interval
First-Generation	2.18	0.29	5.70	0.000	1.66 – 2.84
Constant	0.16	0.02	-15.06	0.000	0.13 – 0.21
Design df = 125, F(1,125) = 22.18, Prob > F = 0.0000					

Hypothesis 2c3: First-generation status will be associated with higher likelihood of provision of instrumental support to a father/father figure among college graduates.

Table 4.42 displays the odds of college graduates reporting having provided financial support to their father/father figure in the past 12 months. The results of this analysis indicate that first-generation college graduates are 1.79 times as likely as their continuing generation peers to have paid for their father's living expenses or have provided at least $50 towards their father's living expenses over the last 12 months (p = 0.000).

Table 4.42. Instrumental Support Provided to Father/Father Figure by College Generation Status

Instrumental Support Provided to Father	Odds Ratio	S.E.	t	p-value	Confidence Interval
First-Generation	1.79	0.357	2.93	0.004	1.209-2.661
Constant	0.09	0.013	-16.00	0.000	0.0634-0.116
Design df = 125, F(1,124) = 8.59, Prob > F = 0.0040					

4E3. Hypothesis 3: Potential Mediators and Health

The following hypotheses investigate the relationships between individual potential mediators and health (BMI and blood pressure) using Adjusted Wald tests, chi-squared tests and linear regressions where appropriate. This is the third step of a mediation analysis to establish significance (if any) between potential mediators and the outcome variables.

Hypothesis 3a1: Higher participation in physical activity will be associated with lower BMI.

Table 4.43 displays the results of a linear regression calculated to assess the relationship of BMI and participation in moderate-to-vigorous physical activities. The results indicate that this physical activity mediator is statistically significantly associated with BMI (p =0.014). A significant regression equation was found (F (1,125) = 6.16, Prob F > 0.0144) with an R-squared of 0.0031. Participants' BMI was equal to 27.79 + -

0.72 when physical activity was measured categorically (dichotomized: 0 = below the median and 1 = median or above for college graduates). BMI decreased .72 units for participation at or above the median of daily activities for the week among college graduates.

Table 4.43. Participation in Physical Activity and BMI

BMI	Coefficient	S.E.	t-test	p-value
Physical Activity	-0.72	0.29	-2.48	0.014
Constant	27.79	0.23	121.66	0.000
Design df = 125, F(1,125) = 6.16, Prob > F = 0.0144, R-squared = 0.0031				

Hypothesis 3a2: Higher physical activity will be associated with lower blood pressure.

Table 4.44 displays the results of a logistic regression calculated to assess the relationship of blood pressure and participation in moderate-to-vigorous physical activities. The results indicate that physical activity is not statistically significantly associated with blood pressure (p =0.934). College graduates' likelihood of having prehypertension or hypertension was equally likely if they participated at or above the median of daily activities for the week among college graduates. This result was not statistically significant (F(1,125) = 0.01, Prob F > 0.9341).

Table 4.44. Participation in Physical Activity and Blood Pressure

Blood Pressure not Normal (Prehypertension/hypertension)	Odds Ratio	S.E.	t	p-value	Confidence Interval
Physical Activity	1.01	0.08	0.08	0.934	0.853-1.188
Constant	1.65	0.09	8.95	0.000	1.479-1.847
Design df = 125, F(1,125) = 0.01, Prob > F = 0.9341					

Hypothesis 3a3: Higher fast food consumption will be associated with higher BMI.

Table 4.45 displays the results of a linear regression calculated to assess the relationship of BMI and consumption of fast food. The results indicate that fast food

consumption is statistically significantly associated with BMI (p =0.000). A significant regression equation was found (F (1,125) = 32.34, Prob F > 0.0000) with an R-squared of 0.0146. Participants' BMI was equal to 26.79 + 1.60 when fast food consumption was measured categorically (dichotomized: 0 = at or below the median and 1 = above the median for college graduates). BMI increased 1.60 units for consumption above the median of fast food consumption for the week among college graduates.

Table 4.45. Fast Food Consumption and BMI

BMI	Coefficient	S.E.	t-test	p-value
Fast Food	1.60	0.28	5.69	0.000
Constant	26.79	0.21	127.02	0.000
Design df = 125, F(1,125) = 32.34, Prob > F = 0.0000, R-squared = 0.0146				

Hypothesis 3a4: Higher fast food consumption will be associated with higher blood pressure.

Table 4.46 displays the results of a logistic regression calculated to assess the relationship of blood pressure and fast food consumption. The results indicate that fast food consumption is statistically significantly associated with blood pressure (p =0.000). College graduates' likelihood of having prehypertension or hypertension was 38% more likely if they consumed fast food above the median for the week among college graduates. This result was statistically significant (F (1,125) = 14.61, Prob F > 0.0002).

Table 4.46. Fast Food Consumption and Blood Pressure

Blood Pressure not Normal (Prehypertension or hypertension)	Odds Ratio	S.E.	t	p-value	Confidence Interval
Fast Food Consumption	1.38	0.12	3.82	0.000	1.167-1.627
Constant	1.47	0.08	7.50	0.000	1.326-1.624
Design df = 125, F(1,125) = 14.61, Prob > F = 0.0002					

Hypothesis 3a5: Higher sugar-sweetened beverage consumption will be associated with higher BMI.

Table 4.47 displays the results of a linear regression calculated to predict BMI based on sugar-sweetened beverage consumption. A non-significant regression equation was found (F (1,125) = 3.22, Prob > F = 0.0752) with an R-squared of 0.0015. Participants' BMI was equal to 27.64 + -0.49 when sugar-sweetened beverage consumption was measured categorically (dichotomized: 0 = at or below the median and 1 = above the median for college graduates). BMI decreased 0.49 units for consumption above the median of sugar-sweetened beverages for the week among college graduates.

Table 4.47. Sugar-sweetened Beverage Consumption and BMI

Variable (BMI)	Coefficient	S.E.	t-test	p-value
Sugar-Sweetened Beverages	-0.49	0.27	-1.79	0.075
Constant	27.64	0.25	108.97	0.000
Design df = 125, F(1,125) = 3.22, Prob > F = 0.0752, R-squared = 0.0015				

Hypothesis 3a6: Higher sugar-sweetened beverage consumption will be associated with higher blood pressure.

Table 4.48 displays the results of a logistic regression calculated to assess the relationship of blood pressure and sugar-sweetened beverage consumption. The results indicate that sugar-sweetened beverage consumption is statistically significantly associated with blood pressure (p =0.000). College graduates' likelihood of having prehypertension or hypertension was 1.40 times more likely if they consumed sugar-sweetened beverages above the median for the week among college graduates. This result was statistically significant (F(1,125) = 14.33, Prob F > 0.0002).

Table 4.48. Sugar-Sweetened Beverage Consumption and Blood Pressure

Blood Pressure not Normal (Prehypertension or hypertension)	Odds Ratio	S.E.	t	p-value	Confidence Interval
Sugar-sweetened beverage Consumption	1.25	0.11	2.53	0.013	1.049-1.486
Constant	1.50	0.09	6.90	0.000	1.335-1.684
Design df = 125, F(1,125) = 6.39, Prob > F = 0.0127					

Hypothesis 3a7: History of smoking will be associated with higher BMI.

Table 4.49 displays the results of a linear regression calculated to assess the relationship of smoking to BMI. A non-significant regression equation was found (F (1,125) = 0.09, Prob > F = 0.7693) with an R-squared of 0.0000. Participants' BMI was equal to 27.38 + 0.10 when history of smoking was measured categorically (dichotomized: 0 = did not smoke cigarettes regularly and 1 = smoked cigarettes regularly). BMI increased 0.10 units for history of smoking among college graduates.

Table 4.49. History of Smoking Regularly and BMI

Variable (BMI)	Coefficient	S.E.	t-test	p-value
History of Smoking	0.10	0.33	0.29	0.769
Constant	27.38	0.20	137.54	0.000
Design df = 125, F(1,125) = 0.09, Prob > F = 0.7693, R-squared = 0.0000				

Hypothesis 3a8: History of smoking will be associated with higher blood pressure.

Table 4.50 displays the results of a logistic regression calculated to assess the relationship of blood pressure and history of smoking. The results indicate that history of smoking is statistically significantly associated with blood pressure (p =0.000). College graduates' likelihood of having prehypertension or hypertension was 1.40 times more likely if they had a history of smoking. This result was statistically significant (F (1,125) = 12.93, Prob F > 0.0005).

Table 4.50. History of Smoking Regularly by Blood Pressure

Blood Pressure not Normal (Prehypertension or hypertension)	Odds Ratio	S.E.	t	p-value	Confidence Interval
History of Smoking	1.40	0.13	3.60	0.000	1.165-1.692
Constant	1.50	0.07	8.19	0.000	1.360-1.654
Design df = 125, F(1,125) = 12.93, Prob > F = 0.0005					

Hypothesis 3b1: Higher stress will be associated with higher BMI.

Table 4.51 displays the results of a linear regression calculated to predict BMI based on frequency of stress. A non-significant regression equation was found (F (1,125) = 0.24, Prob > F = 0.6262) with an R-squared of 0.0001. Participants' predicted BMI was equal to 27.53 + -0.11 when stress was measured on a scale (0 = never, 4 = very often) by frequency experienced in the past month. BMI decreased 0.11 units for every unit of stress experienced in the past month. The results indicate that stress is not statistically significantly associated with BMI.

Table 4.51. Stress and BMI

BMI	Coefficient	S.E.	t-test	p-value
Stress	-0.11	0.23	-0.49	0.626
Constant	27.53	0.31	88.28	0.000
Design df = 125, F(1,125) = 0.24, Prob > F = 0.6262, R-squared = 0.0001				

Hypothesis 3b2: Higher stress will be associated with higher blood pressure.

Table 4.52 displays the results of a logistic regression calculated to assess the relationship of blood pressure and stress. The results indicate that stress frequency is not statistically significantly associated with blood pressure (p =0.710). College graduates' likelihood of having prehypertension or hypertension was 2% more likely for every change from never experienced stress to very often experiencing it (0 = never to 4 = very often). This result was not statistically significant (F(1,125) = 0.14, Prob F > 0.7096).

Table 4.52. Stress and Blood Pressure

Blood Pressure not Normal (Prehypertension or hypertension)	Odds Ratio	S.E.	t	p-value	Confidence Interval
Stress Frequency	0.98	0.05	-0.37	0.710	0.8879-1.092
Constant	1.69	0.12	7.17	0.000	1.464-1.958
Design df = 125, F(1,125) = 0.14, Prob > F = 0.7096					

Hypothesis 3c1: Receipt of social support will be associated with lower BMI.

Table 4.53 displays the results of a linear regression calculated to predict BMI based on social support received. The results indicate that the receipt of social support is statistically significantly associated with BMI. A significant regression equation was found (F (1,125) = 10.45, Prob > F = 0.0016) with an R-squared of 0.0034. Participants' predicted BMI was equal to 27.642 + -0.854 when receipt of social support by parents/family in the past year was measured dichotomously (0 = not received, 1 = received). BMI decreased 0.854 units for receipt of social support in the past month. Receipt of instrumental social support has a negative relationship to BMI, i.e. having received instrumental support is associated with an almost one point lower (0.854) BMI (p =0.002).

Table 4.53. Receipt of Instrumental Social Support and BMI

BMI	Coefficient	S.E.	t-test	p-value
Instrumental Support	-0.854	0.264	-3.23	0.002
Constant	27.642	0.204	135.72	0.000
Design df = 125, F(1,125) = 10.45, Prob > F = 0.0016, R-squared = 0.0034				

Hypothesis 3c2: Receipt of social support will be associated with lower blood pressure.

Table 4.54 displays the results of a logistic regression calculated to assess the relationship of blood pressure and instrumental social support. The results indicate that instrumental social support is not statistically significantly associated with blood pressure

(p =0.162). College graduates' likelihood of having prehypertension or hypertension was 14% more likely if they had received a financial gift from parents or relatives in the last 12 months. This result was not statistically significant (F (1,125) = 1.98, Prob F > 0.1618).

Table 4.54. Receipt of Instrumental Social Support by Blood Pressure

Blood Pressure not Normal (Prehypertension or hypertension)	Odds Ratio	S.E.	t	p-value	Confidence Interval
Instrumental Support Received	1.14	0.11	1.41	0.162	0.947-0.1376
Constant	1.60	0.07	10.23	0.000	1.463-1.756
Design df = 125, F(1,125) = 1.98, Prob > F = 0.1618					

Hypothesis 3c3: Provision of social support to mother/mother figure will be associated with higher BMI.

Table 4.55 displays the results of a linear regression of financial support provided to a mother/mother figure in the last 12 months on BMI. A significant regression equation was found (F (1,124) = 22.88, Prob > F = 0.0000) with an R-squared of 0.0134. Participants' predicted BMI was equal to 26.991 + 1.869 when provision of social support to mother/mother figure in the past year was measured dichotomously (0 = not provided, 1 = provided). BMI increased 1.869 units for provision of social support in the past year. The results indicate that provision of financial support to a mother/mother figure is statistically significantly associated with BMI (p = 0.000).

Table 4.55. Provision of Instrumental Social Support to Mother/Mother Figure

BMI	Coefficient	S.E.	t-test	p-value
Instrumental Support Provided to Mother/Mother Figure	1.87	0.39	4.78	0.000
Constant	26.99	0.20	133.23	0.000
Design df = 124, F(1,124) = 22.88, Prob > F = 0.0000, R-squared = 0.0134				

Hypothesis 3c4: Provision of social support to mother/mother figure will be associated with higher blood pressure.

Table 4.56 displays the results of a logistic regression calculated to assess the relationship of blood pressure and instrumental support provided to a mother/mother figure in the past 12 months. The results indicate social support provided to a mother/mother figure is not statistically significantly associated with blood pressure (p =0.292). College graduates' likelihood of having prehypertension or hypertension was 12% more likely if they had provided social support to their mother/mother figure. This result was not statistically significant (F (1,124) = 1.12, Prob F > 0.2918).

Table 4.56. Provision of Instrumental Social Support to Mother/Mother Figure by Blood Pressure

Blood Pressure not Normal (Prehypertension or hypertension)	Odds Ratio	S.E.	t	p-value	Confidence Interval
Instrumental Support Provided to Mother/Mother Figure	1.12	0.12	1.06	0.292	0.904-1.394
Constant	1.61	0.08	9.71	0.000	1.464-1.779
Design df = 124, F(1,124) = 1.12, Prob > F = 0.2918					

Hypothesis 3c5: Provision of social support to father/father figure will be associated with higher BMI.

Table 4.57 displays the results of a linear regression calculated to predict BMI based on social support provided to father/father figure in the past 12 months. A significant regression equation was found (F(1,124) = 8.85, Prob > F = 0.0035) with an R-squared of 0.0059. Participants' predicted BMI was equal to 27.140 + 1.590 when provision of social support to father/father figure was measured dichotomously in the past year (0 = Not provided, 1 = Provided). BMI increased 1.590 units for provision of social

support in the past year. The results indicate that provision of financial support to a father/father figure is statistically significantly associated with BMI (p=0.004).

Table 4.57. Provision of Instrumental Social Support to Father/Father Figure

BMI	Coefficient	S.E.	t-test	p-value
Instrumental Support Provided	1.59	0.54	2.97	0.004
Constant	27.14	0.21	130.23	0.000
Design df = 124, F(1,124) = 8.85, Prob > F = 0.0035, R-squared = 0.0059				

Hypothesis 3c6: Provision of social support to father/father figure will be associated with lower blood pressure.

Table 4.58 displays the results of a logistic regression calculated to assess the relationship of blood pressure and instrumental support provided to a father/father figure in the past 12 months. The results indicate social support provided to a father/father figure is not statistically significantly associated with blood pressure (p =0.628). College graduates' likelihood of having prehypertension or hypertension was 7% more likely if they had provided social support to their father/father figure. This result was not statistically significant (F (1,124) = 0.24, Prob F > 0.6284).

Table 4.58. Provision of Instrumental Social Support to Father by Blood Pressure

Blood Pressure not Normal (Prehypertension or hypertension)	Odds Ratio	S.E.	t	p-value	Confidence Interval
Instrumental Support Provided to Father/Father Figure	1.07	0.16	0.49	0.628	0.803-1.435
Constant	1.66	0.08	10.75	0.000	1.509-1.816
Design df = 124, F(1,124) = 0.24, Prob > F = 0.6284					

4E4. Hypothesis 4: First-generation Status and Health, Controlling for Mediators

Research Questions #1 - #4 follow the four steps of a mediation analysis as specified by Baron & Kenny (Baron & Kenny, 1986). Hypotheses 4a1 – 4c4 investigate

the relationship between the main independent variable (first-generation status) and health (BMI and blood pressure, individually), while controlling for mediators. Steps #1 - #3 established the evidence of significance of variables required for Step #4. This step of a mediation analysis aims to assess whether or not the impact of a significant relationship between an independent variable and an outcome changes as a result of controlling for a mediator. BMI, the only outcome that was significantly different between the first-generation and continuing generation group in hypothesis 1, and mediators that were significant in hypothesis 2 and hypothesis 3, were used in Step #4 to test for mediation of the relationship between first-generation college graduate status and health. See table 4.59 for a summary of significant variables from mediation steps #1 - #3.

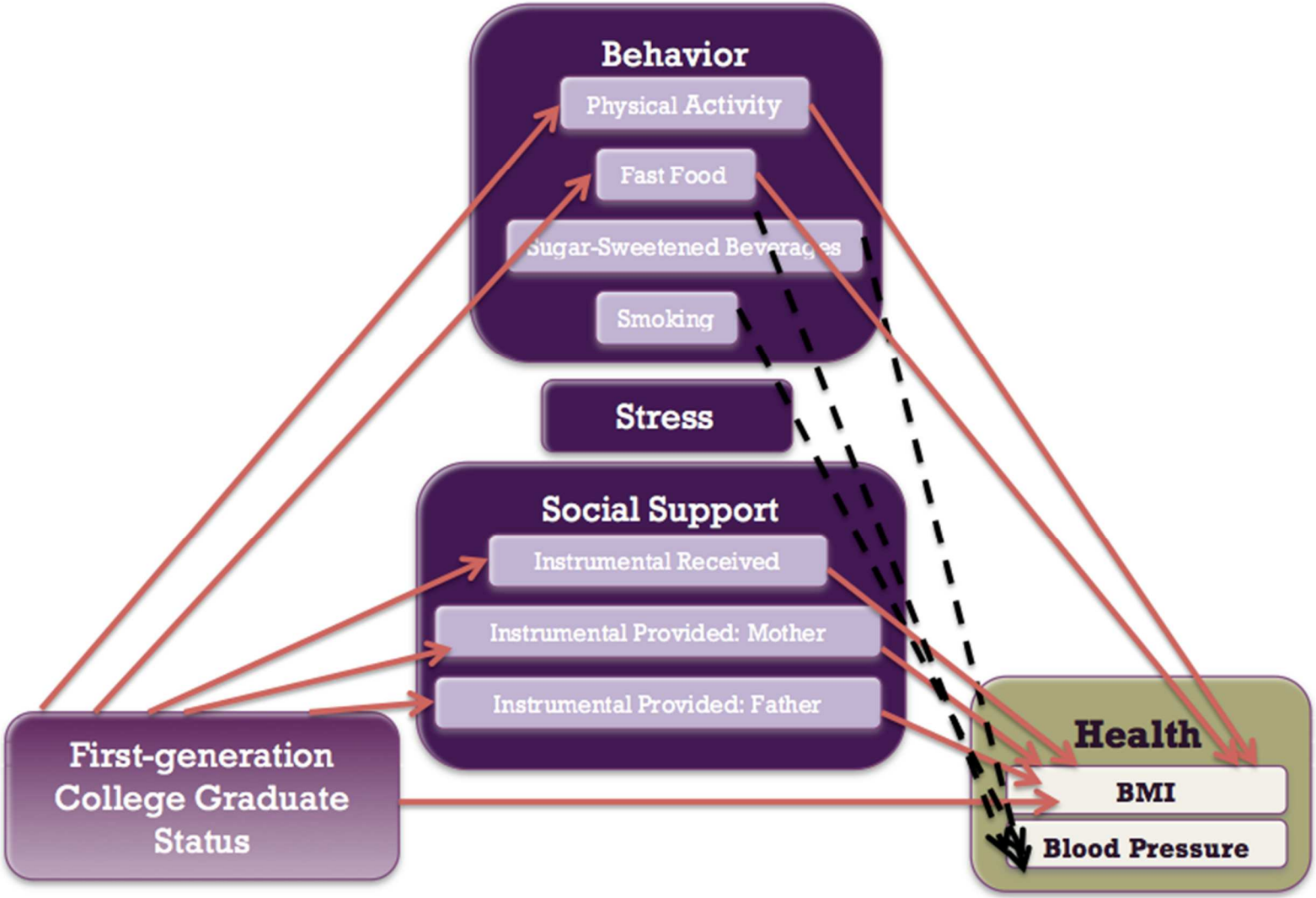
Table 4.59. Significant Associations from Step #1 – #3 in Mediation Analysis

RQ 1/STEP1	RQ 2/STEP 2	RQ3/STEP 3	
Significant to BMI	**Significantly Different by First-Generation Status**	**Significantly Related to BMI**	**Significantly Related to Blood Pressure**
First-Generation Status	Physical Activity	Physical Activity	Fast Food
	Fast Food	Fast Food	Sugar-Sweetened Beverages
	Instrumental Support Received	Instrumental Support Received	History of Smoking
	Instrumental Support Provided to Mother	Instrumental Support Provided to Mother	
	Instrumental Support Provided to Father	Instrumental Support Provided to Father	

The final mediation step models are presented as unadjusted (not controlling for adolescent family income) and adjusted (controlling for adolescent family income – a variable that was shown to be statistically significantly different between the first-generation college graduates and continuing generation college graduates. Multiple

imputation was used to account for missing adolescent family income (19% of weighted college graduate sample) largely stemming from the fact that not all parents were available to complete a parent questionnaire when adolescents were first surveyed during Wave I. All of the models remained the same in terms of significance. A total of 3,823 observations were complete in terms of having parental income data, 1,130 were incomplete so 1,130 were imputed totaling 4,953. The "survey" command was used to account for survey design and oversampling for these estimates, as used in all the previous analyses bringing the weighted sample to n=4,737 college graduates.

Figure 4.8. Conceptual Model with Significant Relationships Identified



Hypothesis 4a1: Physical activity will mediate the relationship between first-generation status and BMI.

Table 4.60 displays the results of a multiple regression model testing the significance of first-generation status on BMI while controlling for physical activity. A significant regression equation was found (F (2,124) = 20.70, P > 0.0000) with an R-squared of 0.0213. Participants' predicted BMI was equal to 26.96 + 1.75 + -0.61 where first-generation status is coded as 0 = continuing generation and 1 = first-generation, and where moderate-to-vigorous physical activity was measured categorically (dichotomized: 0 = below the median and 1 = median or above for college graduates). BMI increased 1.75 units for first-generation status as compared to continuing generation status and decreased 0.61 body mass index points for participation in physical activity at or above the median for college graduates. Both first-generation status and physical activity had a significant association with BMI. The results indicate that first-generation college graduate status remains statistically significantly associated with increasing BMI when controlling for the statistically significant variable of physical activity (p = 0.032).

Table 4.60. BMI, First-Generation Status and Physical Activity

BMI	**Coefficient**	**S.E.**	**t-test**	**p-value**
Physical Activity	-0.61	0.28	-2.17	0.032
First-Generation	1.75	0.28	6.22	0.000
Constant	26.96	0.25	109.20	0.000
Design df = 125, F(2,124) = 20.70, Prob > F = 0.0000, R-squared = 0.0213				

Table 4.61 below displays the same regression, but controlling for the multiply–imputed adolescent family income. The results do not change in terms of significance.

Table 4.61. BMI, First-Generation Status and Physical Activity Controlling for Adolescent Family Income (Imputation Estimate)

BMI	Coefficient	S.E.	t-test	p-value
Physical Activity	-0.58	0.28	-2.09	0.039
First-Generation	1.55	0.28	5.62	0.000
Adolescent Family Income	-0.007	0.002	-3.08	0.003
Constant	27.50	0.27	100.05	0.000
Complete DF = 125, F(3,119.9) = 17.11, Prob > F = 0.0000				

Hypothesis 4a2: Physical activity will mediate the relationship between first-generation status and blood pressure.

This hypothesis testing is not applicable given that first-generation status was not significant to blood pressure in Mediation Step 1.

Hypothesis 4a3: Fast food consumption will mediate the relationship between first-generation status and BMI.

Table 4.62 displays the results of a regression model testing the significance of first-generation status on BMI while controlling for fast food consumption. A significant regression equation was found (F (2,124) = 33.30, Prob > F = 0.0000) with an R-squared of 0.0303. Participants' predicted BMI was equal to 26.14 + 1.63 + 1.40 where first-generation status is coded as 0 = continuing generation and 1 = first-generation and where fast food was measured categorically (dichotomized: 0 = median or below and 1 = above the median for college graduates for fast food consumption in the past week). BMI increased 1.63 units for first-generation status as compared to continuing generation status and increased 1.40 body mass index points for fast food consumption above the median. The results indicate that first-generation college graduate status is statistically significantly associated (p = 0.000) with increased BMI, and fast food consumption is not significant in this model (p = 0.000).

Table 4.62. BMI, First-Generation Status and Fast Food Consumption

BMI	Coefficient	S.E.	t	p-value
Fast Food	1.40	0.28	5.10	0.000
First-Generation	1.63	0.28	5.81	0.000
Constant	26.14	0.22	116.98	0.000
Design df = 125, F(2,124) = 33.30, Prob > F = 0.0000, R-squared = 0.0303				

Table 4.63 below displays the same regression, but controlling for the multiply–imputed adolescent family income. The results do not change in terms of significance.

Table 4.63. BMI, First-Generation Status and Fast Food Controlling for Adolescent Family Income (Imputation Estimate)

Variable (BMI)	Coefficient	S.E.	t-test	p-value
Fast Food	1.37	0.28	4.94	0.000
First-Generation	1.45	0.27	5.26	0.000
Adolescent Family Income	-0.007	0.002	-2.91	0.004
Constant	26.68	0.25	105.53	0.000
Complete DF = 125, F(3,121.4) = 25.47, Prob > F = 0.0000				

Hypothesis 4a4: Fast food consumption will mediate the relationship between first-generation status and blood pressure.

This hypothesis testing is not applicable given that first-generation status was not significant to blood pressure in Mediation Step 1.

Hypothesis 4a5: Sugar-sweetened beverage consumption will mediate the relationship between first-generation status and BMI.

Table 4.64 displays the results of a multiple regression model testing the significance of first-generation status on BMI while controlling for sugar-sweetened beverage consumption. A significant regression equation was found (F (2,124) = 20.43 Prob > F = 0.0000) with an R-squared of 0.0210. Participants' predicted BMI was equal to 26.87 + 1.81 + -0.56 where first-generation status is coded as 0 = continuing generation and 1 = first-generation and where sugar—sweetened beverages consumed

was measured categorically (dichotomized: 0 = median or below and 1 = above the median for college graduates for beverages consumed in the past week). BMI increased 1.801 units for first-generation status as compared to continuing generation status and decreased 0.56 index points for sugar-sweetened beverage consumption above the median. The results indicate that first-generation college graduate status (p=0.000) and sugar-sweetened beverage consumption (p=0.038) is statistically significantly associated with increasing BMI.

Table 4.64. BMI, First-Generation Status and Sugar-Sweetened Beverage Consumption

BMI	Coefficient	S.E.	t	p-value
Sugar Sweetened Beverages	-0.56	0.27	-2.09	0.038
First-Generation	1.81	0.29	6.35	0.000
Constant	26.87	0.25	105.58	0.000
Design df = 125, F(2,124) = 20.43, Prob > F = 0.0000, R-squared = 0.0210				

Table 4.65 below displays the same regression, but controlling for the multiply–imputed adolescent family income. The results do not change in terms of significance.

Table 4.65. BMI, First-Generation Status and Sugar-Sweetened Beverages Controlling for Adolescent Family Income (Imputation Estimate)

BMI	Coefficient	S.E.	t-test	p-value
Sugar-Sweetened Beverages	-0.57	0.26	-2.15	0.033
First-Generation	1.60	0.28	5.75	0.000
Adolescent Family Income	-0.007	0.002	-3.22	0.002
Constant	27.44	0.28	98.83	0.000
Complete DF = 125, F(3,120.4) = 16.87, Prob > F = 0.0000				

Hypothesis 4a6: History of Smoking will mediate the relationship between first-generation status and BMI.

Table 4.66 displays the results of a multiple regression model testing the significance of first-generation status on BMI while controlling for having ever smoked regularly. A significant regression equation was found (F (2,124) = 19.96 Prob > F =

0.0000) with an R-squared of 0.0193. Participants' predicted BMI was equal to 26.571 + 1.797 + 0.154 where first-generation status is coded as 0 = continuing generation and 1 = first-generation and where having ever smoked regularly was measured dichotomously (0 = never smoked regularly and 1 = smoked regularly). BMI increased 1.797 units for first-generation status as compared to continuing generation status and decreased 0.154 index points for those who had ever smoked as compared to those who did not. The results indicate that first-generation college graduate status is statistically significantly associated (p = 0.000) with increasing BMI, however a history of smoking regularly is not statistically significant in this model (p = 0.623).

Table 4.66. BMI, First-Generation Status and History of Smoking Regularly

BMI	Coefficient	S.E.	t	p-value
Smoking	0.154	0.313	0.49	0.623
First-Generation	1.797	0.286	6.28	0.000
Constant	26.571	0.223	119.09	0.000
Design df = 125, F(2,124) = 19.96, Prob > F = 0.0000, R-squared = 0.0193				

Table 4.67 below displays the same regression, but controlling for the multiply–imputed adolescent family income. The results do not change in terms of significance.

Table 4.67. BMI, First-Generation Status and History of Smoking Controlling for Adolescent Family Income (Imputation Estimates)

BMI	Coefficient	S.E.	t-test	p-value
History of Smoking	.1649	.3084	0.53	0.594
First-Generation	1.5889	.2802	5.67	0.000
Adolescent Family Income	-.0074	.0023	-3.18	0.002
Constant	27.1291	.2683	101.11	0.000
Complete DF = 125, F(3,120.2) = 17.86, Prob > F = 0.0000				

Hypothesis 4a7: History of smoking will mediate the relationship between first-generation status and blood pressure.

This hypothesis testing is not applicable given that first-generation status was not significant to blood pressure in Mediation Step 1.

Hypothesis 4b1: Stress will mediate the relationship between first-generation status and BMI.

Table 4.68 displays the results of a regression model testing the significance of first-generation status on BMI while controlling for frequency of stress in the past month. A significant regression equation was found (F (2,124) = 22.21, Prob > F = 0.0000) with an R-squared of 0.0193. Participants' predicted BMI was equal to 26.770 + 1.796 + -0.148 where first-generation status is coded as 0 = continuing generation and 1 = first-generation and, where stress was measured numerically on a scale (0 = never and 4 = very often). BMI increased 1.796 units for first-generation status as compared to continuing generation status and decreased 0.148 index points for every unit decrease in frequency of stress. The results indicate that first-generation college graduate status is statistically significantly associated (p = 0.000) with increasing BMI, however stress is not statistically significant in this model (p = 0.509).

Table 4.68. BMI, First-Generation Status and Stress

BMI	Coefficient	S.E.	t	p-value
Stress	-.148	0.224	-0.66	0.509
First-Generation	1.796	0.284	6.32	0.000
Constant	26.770	0.341	78.42	0.000
Design df = 125, F(2,124) = 22.21, Prob > F = 0.0000, R-squared = 0.0193				

Table 4.69 below displays the same regression, but controlling for the multiply–imputed adolescent family income. The results do not change in terms of significance.

Table 4.69. BMI, First-Generation Status and Stress Controlling for Adolescent Family Income (Imputation Estimate)

BMI	Coefficient	S.E.	t-test	p-value
Stress Scale	-.1529	.2292	-0.67	0.506
First-Generation	1.5878	.2776	5.72	0.000
Adolescent Family Income	-.0074	.0023	-3.17	0.002
Constant	27.3358	.3842	71.15	0.000
Complete DF = 125, F(3,120.2) = 17.65, Prob > F = 0.0000				

Hypothesis 4b2: Stress will mediate the relationship between first-generation status and blood pressure.

This hypothesis testing is not applicable given that first-generation status was not significant to blood pressure in Mediation Step 1.

Hypothesis 4c1: Social support received will mediate the relationship between first-generation status and BMI.

Table 4.70 displays the results of a multiple regression model testing the significance of first-generation status on BMI while controlling for receipt of support from parents over the last 12 months. A significant regression equation was found (F (2,124) = 20.83, Prob > F = 0.0000) with an R-squared of 0.0212. Participants' predicted BMI was equal to 26.81964 + 1.739 + -0.652 where first-generation status is coded as 0 = continuing generation and 1 = first-generation and where support received was dichotomized (0 = did not receive and 1 = received). BMI increased 1.739 units for first-generation status as compared to continuing generation status and decreased 0.652 index points for having received instrumental social support as compared to not receiving it. The results indicate that first-generation college graduate status is statistically significantly associated (p = 0.000) with increasing BMI, and receipt of instrumental social support was statistically significant in this model (p = 0.011).

Table 4.70. BMI, First-Generation Status & Instrumental Social Support Received

BMI	Coefficient	S.E.	t	p-value
Support Received	-.652	0.253	-2.58	0.011
First-Generation	1.739	0.279	6.23	0.000
Constant	26.81964	0.220	122.02	0.000
Design df = 125, F(2,124) = 20.83, Prob > F = 0.0000, R-squared = 0.0212				

Table 4.71 below displays the same regression, but controlling for the multiply–imputed adolescent family income. The results do not change in terms of significance.

Table 4.71. BMI, First-Generation Status and Receipt of Instrumental Social Support Controlling for Adolescent Family Income (Imputation Estimate)

BMI	Coefficient	S.E.	t-test	p-value
Receipt of Social Support	-.5990	.2581	-2.32	0.022
First-Generation	1.5429	.2732	5.65	0000
Adolescent Family Income	-.0071	.0023	-3.14	0.002
Constant	27.3454	.2433	112.39	0.000
Complete DF = 125, F(3,120.8) = 18.16, Prob > F = 0.0000				

Hypothesis 4c2: Social support provided will mediate the relationship between first-generation status and blood pressure.

This hypothesis testing is not applicable given that first-generation status was not significant to blood pressure in Mediation Step 1.

Hypothesis 4c3: Social support received will mediate the relationship between first-generation status and BMI.

Table 4.72 displays the results of a regression model testing the significance of first-generation status on BMI while controlling for provision of support to mother/mother figure over the last 12 months. A significant regression equation was found (F (2,123) = 24.61, Prob > F = 0.0000) with an R-squared of 0.0270. Participants' predicted BMI was equal to 26.383 + 1.517 + 1.578 where first-generation status is coded as 0 = continuing generation and 1 = first-generation and, where support provided to mother/mother figure was dichotomized (0 = did not provide and 1 = provided). BMI increased 1.517 units for first-generation status as compared to continuing generation status and increased 1.578 index points for having provided instrumental social support as compared to not providing it. The results indicate that first-generation college graduate status remains statistically significantly associated (p = 0.000) with increasing BMI, and provision of instrumental social support to a mother/mother figure remains statistically significant (p = 0.000).

Table 4.72. BMI, First-Generation Status and Instrumental Social Support Provided to Mother/Mother Figure

BMI	Coefficient	S.E.	t	p-value
Support Provided to Mother	1.578	0.379	4.16	0.000
First-Generation	1.517	0.272	5.58	0.000
Constant	26.383	0.220	119.99	0.000
Design df = 124, F(2,123) = 24.61, Prob > F = 0.0000, R-squared = 0.0270				

Table 4.73 below displays the same regression, but controlling for the multiply–imputed adolescent family income. The results do not change in terms of significance.

Table 4.73. BMI, First-Generation Status and Provision of Instrumental Social Support to Mother/Mother Figure Controlling for Adolescent Family Income (Imputation Estimate)

BMI	Coefficient	S.E.	t-test	p-value
Provision of Social Support to Mother/Mother Figure	1.4863	.3810	3.90	0.000
First-Generation	1.3674	.2678	5.11	0.000
Adolescent Family Income	-.0058	.0022	-2.58	0.011
Constant	26.8358	.2497	107.47	0.000
Complete DF = 125, F(3,119.9) = 19.32, Prob > F = 0.0000				

Table 4.74 displays the results of a regression model testing the significance of first-generation status on BMI while controlling for provision of support to father/father figure over the last 12 months. A significant regression equation was found (F (2,123) = 18.35, Prob > F = 0.0000) with an R-squared of 0.0236. Participants' predicted BMI was equal to 26.450 + 1.699 + 1.354 where first-generation status is coded as 0 = continuing generation and 1 = first-generation and, where support provided to father/father figure was dichotomized (0 = Did not provide and 1 = Provided). BMI increased 1.699 units for first-generation status as compared to continuing generation status and increased 1.354 index points for having provided instrumental social support as compared to not providing it. The results indicate that first-generation college graduate status is statistically significantly associated (p = 0.000) with increasing BMI and provision of

instrumental social support to a father/father figure was statistically significant in this model (p = 0.009).

Table 4.74. BMI, First-Generation Status and Instrumental Social Support Provided to Father/Father Figure

Variable (BMI)	Coefficient	S.E.	t	p-value
Support Provided to Father	1.354	0.512	2.65	0.009
First-Generation	1.699	0.292	5.82	0.000
Constant	26.450	0.235	112.65	0.000
Design df = 124, F(2,123) = 18.35, Prob > F = 0.0000, R-squared = 0.0236				

Table 4.75 below displays the same regression, but controlling for the multiply–imputed adolescent family income. The results do not change in terms of significance.

Table 4.75. BMI, First-Generation Status and Provision of Instrumental Social Support to Father/Father Figure Controlling for Adolescent Family Income (Imputation Estimate)

Variable (BMI)	Coefficient	S.E.	t-test	p-value
Provision of Social Support to Father/Father Figure	1.2504	.5076	2.46	0.015
First-Generation	1.5333	.2910	5.27	0.000
Adolescent Family Income	-.0061	.0022	-2.76	0.007
Constant	26.9297	.2545	105.80	0.000
Complete DF = 125, F(3,11949) = 15.60, Prob > F = 0.0000				

Hypothesis 4c4: Social support received will mediate the relationship between first-generation status and blood pressure.

This hypothesis testing is not applicable given that first-generation status was not significant to blood pressure in Mediation Step 1.

Chapter 5. Discussion

5A. Overview of Findings

The main purpose of this research was to investigate the relationships between first-generation college graduate status and health (as measured by BMI and blood pressure) and to investigate potential mediators of this relationship. Findings from this innovative study expand the limited extant literature about the first-generation college graduate population and their outcomes. Findings provide insights for researchers, practitioners and policymakers to provide first-generation college students, who will hopefully become first-generation college graduates, with resources and support to transition into a healthy adulthood, post-college. This chapter summarizes key findings from this research, discusses implications of these findings for practice and policy and describes opportunities for future research.

5B. Discussion of Descriptive Aim Findings

Findings from this study describe the socio-demographic characteristics of a nationally representative sample of adolescents in adulthood, as college graduates, and compares the first-generation and continuing generation sub-populations on these characteristics. A little less than half of the college graduate sample – 2,078 or 44.29% are first-generation college graduates as compared to the 2,659, or 55.71% that are continuing generation college graduates. First-generation and continuing generation college graduates were similar in terms of age, sex and current household income before taxes (with the exception of the percentage of participants in the $150,000+ category, with less first-generation college graduates compared to continuing generation college students in this category). The sample was followed-up for WAVE IV in 2008 to 2009.

The national real median household income fell between these two years from $51,726 in 2008 to $50,221 in 2009 (U.S. Census Bureau, Noss, 2010). It is possible that this decline was related to the Great Recession which began in December 2007 and ended in June 2009 (NBER, 2010). Since the Ecological Model of Health emphasizes multiple layers of influence from the individual to the community and policy levels on health, it is important to keep in mind that Add Health participants were surveyed during a historical event in the economic recession. With that said, the greatest proportion of both first and continuing generation college graduates were in the $50,000-$74,999 category. There were statistically significant differences between first-generation and continuing generation college graduates in terms of race, ethnicity, access to health insurance, and adolescent family income. First-generation college graduates were 60% more likely to be of a minority group than continuing generation college graduates. Among first-generation college graduates, 11.34% are Hispanic, of all races as compared to 4.38% among continuing generation college graduates. In other words, first-generation college graduates were three times more likely to be Hispanic. Although first-generation college graduates were almost equally as likely as their continuing generation peers to have incomes of $50,000 or greater, they were less likely to have access to health insurance: 92% for continuing generation and 89% for first-generation college graduates.

While the literature indicates that first-generation college graduates are more likely to come from lower income backgrounds, perhaps the most striking finding of the demographic analysis was the statistically significant difference in the median of parent-reported adolescent family income of first and continuing generation college graduates, which was $40,000 and $63,000, respectively (U.S. Department of Education et al.,

1998). The median parent-reported adolescent family income for college graduates as a whole was $51,000 and first-generation college graduates were almost four times more likely than continuing generation college graduates to come from a family with an income below the median for college graduates. Approximately 19% of parent-reported household income data was not available, but of the available data, the missingness did not differ by college graduate status. Multiple imputation methods for missing income data were used to re-run the multivariate analyses in Hypotheses 4 to control for continuous adolescent family income. The additional multivariate analyses for Hypotheses 4 that included this imputed income data, did not change in terms of significance of variables as compared to the models that did not control for adolescent family income (Tables 4.61, 63, 65, 67, 69, 71, 73, 75).

5C. Health Outcomes and Potential Mediator Findings

5C1. Health Outcomes

The mean BMI of college graduates was 27.42, putting college graduates approximately in the middle of the overweight category, according to national guidelines (overweight BMI = 25.0 – 29.9) (CDC, 2015a). The age-adjusted prevalence of obesity in the United States is 34.9%, but was much lower in this nationally representative sample of college graduates at 27% (Ogden et al., 2014). This finding supports the idea that increased educational attainment is associated with decreased chronic disease risk. However, when this finding is compared to data from a decade ago documenting obesity by educational attainment, the prevalence of obesity appears to have risen approximately an additional 11% to 27% from a rate of 16% among those with a bachelor's degree or higher (Baum and Payea, 2005). This illustrates the point that the obesity epidemic has

indeed grown over the past decade, even among those who have a bachelor's degree or greater education.

The mean blood pressure measurement of college graduates was 123.50/78.35. Approximately 46% of college graduates were in the "prehypertension" blood pressure category, defined as having a systolic pressure of 120-139 or diastolic pressure of 80-89. The next greatest percentage (38%) was in the "normal" category, defined as a systolic pressure less than 120, and diastolic pressure less than 80. Nationally, about one-third of adults have high blood pressure and about one-third have prehypertension (CDC, 2015c). The college graduate sample's prevalence of hypertension was almost half of that of adults nationally at 17%, with a greater percentage in the hypertension category (46%), as mentioned earlier. Again, this finding also supports the idea that increased educational attainment is associated with decreased chronic disease risk as the rate of hypertension among this college graduate sample was nearly half that of the national rate for adults.

The mean BMI of first-generation college graduates was statistically different, at two index points higher, than continuing generation college graduates. The bulk of college graduates were in the normal weight category (40%) and among the subpopulations of first and continuing generation college graduates, the majorities were in the normal range. However, a larger percent of first-generation college graduates (32%) were in the obesity range as compared to continuing generation college graduates (22%).

The mean blood pressures of first and continuing generation college graduates did not differ from each other at 124.02/78.70 and 123.08/78.07, respectively. In addition, the percent of graduates by status, in the normal vs. prehypertension/hypertension categories

was very similar. This finding was surprising as it was hypothesized that blood pressures would differ by college graduate status based on the statistics regarding higher blood pressure prevalence among Blacks and Hispanics and the higher likelihood of first-generation college graduates to be of a minority group. However, the prevalence of high blood pressure increases with age - individuals in the 20-34 year old category have the lowest prevalence (11.1% for men and 6.8% for women) (CDC, 2015c). It is likely that the younger age of this group is a potential reason why there are no differences in blood pressure.

5C2. Mediators

Univariate analysis of summed variables for 7-day recall of daily participation in physical activities, fast food and sugar-sweetened beverage consumption indicated a positively skewed distribution. The results of this analysis suggested transformation of the three health behavior variables into dichotomous variables with responses at or above the median for college graduates. For example, college graduates participated in a median of six moderate-to-vigorous physical activities in the past week. As a result, the physical activity variable was dichotomized into 0 = below 6, and 1 = 6 or above. Approximately 30% of college graduates have smoked regularly in the past or currently smoke; it is hard to compare this statistic to national smoking prevalence (17%) since that number only includes current smokers, and not those who do not currently smoke, but have in the past (CDC, 2015b). College graduates report experiencing stress “almost never,” on a scale from 0 to 4 with 0 = never, 1 = almost never and 4 = very often. In terms of social support, over 25% of college graduates have received financial gifts from their parents or family to help with home purchases or remodeling. College graduates have also provided

for their parents, with close to 20% of them providing financial assistance in excess of $50 to help pay for their mother/mother figure's expenses and 10% of them providing for their father/father figure's expenses in the past year.

The bivariate analysis of mediators by college graduate status indicated that on average, first and continuing generation college graduates had similar participation in moderate-to-vigorous physical activity, history of smoking and experience of stress. The graduates differed with respect to physical activity and fast food consumption, in terms of health behaviors. First and continuing generation college graduates differed with respect to all three social support variables: receipt of social support, provision of social support to mother/mother figure and to father/father figure. A smaller percent of first-generation college graduates (21%) as compared to continuing generation college graduates (30%), received financial gifts from their parents or family in the past year. Meanwhile, a larger percent of first-generation college graduates (26%) as compared to continuing generation college graduates (14%) provided financial support to their mother/mother figures in the past year, 13% and 8% of first-generation and continuing generation college graduates provided for their father/father figures, respectively.

5D. Discussion of Hypotheses Tests

The following sections will discuss the results of each of the four main hypotheses, which paralleled steps #1 - #4 of a mediation analysis (Baron & Kenny, 1986). The discussion will highlight any significant results from the tests of hypotheses.

5D1. First-Generation Status and Outcome Variables

Hypothesis 1 was the first step of the mediation analysis and focused on investigating the potential significance of the main independent variable (college

generation status) to the main dependent variable(s) – health, as measured by BMI and blood pressure. Of the two sub-hypotheses for this step, Hypothesis 1a: First-generation college graduate status will be associated with higher BMIs than continuing generation status among college graduates, was confirmed to be true. A linear regression of BMI and first-generation status indicated first-generation college graduate status had a significant association with BMI. In addition, a logistic regression describing the odds of being overweight indicated that first-generation college graduates were 1.64 times more likely to be overweight or obese than continuing generation college graduates. Modifiable risk behaviors such as physical activity and nutrition (among others including smoking and alcohol use) contribute to prevalence of chronic illness such as obesity. In this study, physical activity and fast food consumption was found to be statistically significantly different by first-generation status and to be statistically significantly associated with BMI which serves to explain a portion of the difference in BMI between first and continuing generation college graduates.

First and continuing generation college graduates were almost equally likely to have prehypertension and hypertension vs. normal blood pressure levels, with both groups having mean blood pressures just slightly above the normal of 120/80 mmHg at 124.02/78.70 and 123.08/78.07, respectively. High blood pressure (140/90 mmHg or above) prevalence increases with age, therefore, a probable explanation for the lack of a significant relationship between first-generation status and blood pressure among college graduates is the relatively young age of the sample (age 24 – 32) (Mayo Clinic, 2014). The findings do not show a statistically significant difference between first and continuing generation college graduates in terms of blood pressure, but do show that

when compared to national statistics on high blood pressure, college graduates in this age group experience hypertension at a lower rate (17%) as compared to 29% of adults nationally (CDC, 2015c). Instead, a larger percent have prehypertension, and although not ideal, essentially have "time" to try to change preventable risk factors to reduce likelihood of high blood pressure. In terms of the mediation analysis, this step established that there was a potential direct relationship that may be mediated. For the purposes of investigating the meditational models, blood pressure was no longer relevant and was not investigated in Step 4 of the mediation analysis. However, for the purpose of this dissertation, blood pressure was investigated as part of Hypothesis 3.

5D2. Hypothesis 2: Potential Mediators and First-Generation Status

Hypothesis 2 was the second step of the mediation analysis and focused on investigating the relationships between the main independent variable (college generation status) and proposed mediators from the conceptual/theoretical framework: physical activity, fast food consumption, sugar-sweetened beverage consumption, smoking, stress, instrumental social support received from parents, instrumental social support provided to mother/mother figure and instrumental social support provided to father/father figure. This step involved treating the mediators as if they were outcome variables. Of the 8 sub-hypotheses, 5 were confirmed to be supported and are listed below:

Hypothesis 2a2: Fast food consumption will differ by first-generation college graduate status among college graduates.

Hypothesis 2a4: Smoking will not differ by first-generation status among college graduates.

Hypothesis 2c1: First-generation status will be associated with lower receipt of instrumental family support among college graduates.

Hypothesis 2c2: First-generation status will be associated with higher provision of instrumental support to mother/mother figure among college graduates.

Hypothesis 2c3: First-generation status will be associated with higher provision of instrumental support to father/father figure among college graduates.

Two of the four proposed health behavior mediators differed by first-generation college graduate status. Physical activity was hypothesized to differ between first and continuing generation college graduates. First-generation college graduates were 22% less likely than continuing generation college graduates to participate in physical activity at or above the median for college graduates. Fast food consumption (having eaten food from a fast food restaurant, such as McDonald's Burger King, Wendy's Arby's, Pizza Hut, Taco Bell, or Kentucky Fried Chicken or a local fast food restaurant in the past week) was also more likely among first-generation college graduates. There are several potential reasons for this difference worth further exploration, for example, some of the demographic differences discovered, including access to health care insurance might affect knowledge of the importance of, or access to places to get involved in physical activity. In addition, although first and continuing generation college graduates were equally as likely to have a household income of $50,000 or above (national median income for 2009 was $50,221), first-generation college graduates were more likely than continuing generation college graduates to come from families that earned below the median for college graduates when they were adolescents. As findings from the social support variables suggest, and consistent with the literature on first-generation college

graduates, they are more likely to need to help support their families financially – this may impact ability to afford expenses that may seem unnecessary, relatively speaking, for example pricey gym memberships or healthier food options. In essence, the continuing generation college graduates may have more disposable income, and in turn, access to health-promoting activities than the first-generation college graduates. First-generation college graduates were less likely than continuing generation college graduates to have a history of smoking regularly (current or past), but this difference was not statistically significantly different. Unlike hypothesized, first-generation and continuing generation college graduates experienced stress at almost identical levels, using the stress scale (α = 0.73) that was constructed from summing five survey items concerning respondent's subjective assessments of stress in the Social Psychology and Mental Health section of Wave IV, as constructed in previous research (Cutler & Lleras-Muney, 2006). Given the increased demands of being a first-generation college student, such as financial barriers stemming from increased likelihood of being from lower-income families, and the importance of being 'well off financially,' it was hypothesized that first-generation college graduates would experience a higher level of stress than their continuing generation peers (IHEP, 2012; Saenz, Hurtado, & Barrera, et al., 2007).

In terms of social support, approximately 21% of first-generation college graduates as compared to 30% of continuing generation college graduates reported receiving financial gifts or loans to help buy, remodel, build or furnish a home or condominium from their parents, in-laws or other relatives, and they were statistically significantly less likely to receive this type of support. A statistically significantly greater percentage of first-generation college graduates 26% as compared to 14% of continuing

generation college graduates reported paying for their mother's living expenses or having provided at least $50 towards their mother's living expenses over the last 12 months. A greater percentage of first-generation college graduates, 13% as compared to 8% of continuing generation college graduates, reported paying for their father's living expenses or having provided at least $50 towards their father's living expenses over the last 12 months. These findings indicate that first-generation college graduates receive less instrumental support from their family, and actually provide more to their families than their continuing generation peers. These findings are particularly important because studies have shown low instrumental support is independently and significantly associated with high blood pressure and depressive symptoms, especially among low-income communities of color (Glanz et al., 2002; Strogatz, Croft, James, Keenan & Browning, et al., 1997);(Israel, Farquhar, Schulz, James, & Parker, 2002). The current study did not find a significant relationship between social support and blood pressure, but it did find a significant relationship between social support received and BMI, and between social support provided and BMI, with these social support variables differing statistically by first-generation and continuing generation college graduate status. Since the study also indicated that first-generation college graduates are more likely to be minorities than continuing generation college graduates, the findings emphasize the important of understanding social support (all dimensions) among first-generation college graduates and the mechanisms through which it may be affecting health.

These findings related to social support are not surprising considering the great, statistically significant difference in median adolescent family income of college graduates ($40,000 for first-generation and $63,000 for continuing generation college

graduates). The numbers suggest that the first-generation college graduates' parents are more likely to need financial assistance and less likely to be able to provide their children with gifts of financial support (financial gifts or loans to help buy, remodel, build or furnish a home or condominium). The results of the descriptive aims of this study indicated that first-generation college graduates were 1.6 times more times likely to be of a minority group, and 2.8 times more likely to be Hispanic as compared to continuing generation college graduates. National statistics on homeownership indicate that homeownership rates among Blacks and Hispanics are 41.9% and 46.7%, respectively, which are both lower than the national rate of 63.8%, and the homeownership rate among Whites – 72.2% (U.S. Census Bureau, 2016). According to the demographic characteristics of first-generation college graduates, in light of these national statistics, it is possible that first-generation college graduates are less likely to be buying, remodeling, building or furnishing a home or condominium, and thus they are less likely to receive that type of support from their family members, however, the finding is interesting taking into consideration the relative equality of the distribution of income ranges of the first and continuing generation college graduates (except for the $150,000 and over category). The limited data on first-generation college graduates corroborates this finding on income as it suggests that they earned comparable salaries and were employed in similar occupations as their non-first-generation peers once they graduated (Horn & Zahn, 2001). It would be intuitive to suggest that one of the reasons they would be less likely to be buying, remodeling, building or furnishing a home or condominium, even though they are on par with their continuing generation peers in terms of income, is precisely because of their increased likelihood to need to assist their parents financially. These findings are

consistent with the literature on first-generation college students that shows a higher percentage of first-generation college students than their peers reported working more than 20 hours a week in their senior year of high school, presumably due to need to help pay tuition, bills and support family. They were also twice more likely to report having a major concern about financing college and a larger percentage cite "being well off financially" as a very important or essential personal goal (Saenz, Hurtado, & Barrera, et al., 2007).

5D3. Hypothesis 3: Potential Mediators and Health

Hypothesis 3 was the third step of the mediation analysis and focused on investigating the relationships between the proposed mediators: physical activity, fast food consumption, sugar-sweetened beverage consumption, smoking, stress, instrumental support received from parents, instrumental support provided to mother/mother figure and instrumental support provided to father/father figure and the dependent variable(s) – health, as measured by BMI and blood pressure. Of the 16 sub-hypotheses, 8 were confirmed to be supported. Five variables (2 health behavior and the 3 social support variables) were found to have a statistically significant relationship to BMI. Three variables were found to be statistically significantly related to blood pressure (fast food consumption, sugar-sweetened beverage consumption and history of smoking), but are not relevant in terms of the mediation analysis since blood pressure was not found to be significantly related to first-generation status in Step 1 of the mediation analysis.

The findings regarding the significance of health behaviors to BMI and blood pressure are rather intuitive and consistent with literature on risk factors for chronic disease. Physical activity, nutrition and smoking are some of the main modifiable

lifestyle factors that contribute to the incidence and prevalence of chronic illness. The findings regarding the significance of receipt of social support from parents and family and provision of social support to parents are somewhat surprising as they are not as intuitive. Social support is composed of four broad categories as described by House (1981) – emotional support, instrumental support, informational support and appraisal support, but the current study only investigated one dimension – instrumental support. Of the four types of social support that can be exchanged among individuals, emotional support is known to be the most strongly and consistently associated with well-being (Glanz et al., 2002). However, relevant to the current research, previous studies have shown that low instrumental support is independently and significantly associated with high blood pressure and depressive symptoms, especially among low-income communities of color (Glanz et al., 2002; Strogatz, Croft, James, Keenan & Browning, et al., 1997);(Israel et al., 2002). The relationship of additional dimensions of social support to first-generation status and health are worth further exploration, as studies strongly suggest that social support, networks and relationships have important causal effects on health, exposure to stress, and on the relationship between stress and health (Glanz et al., 2002);(House, Umberson, & Landis, 1988). For example, one pathway through which social support affects health is through resources at the individual or community level that may help to enhance heath or diminish the negative effects on health due to certain stressors, this is called the "buffering effect" (Glanz et al., 2002). Similarly, social support may affect the frequency and duration of stress - having a social support system or network that is able to provide information, for example, about new jobs, can help reduce the chances an individual might suffer from long-term unemployment. In this

sense, reduced exposure to stress can have the effect of enhanced mental and physical health. Lastly, social support can affect health behaviors through interpersonal exchanges between individuals and within a social network, for example, it can help with adherence to medical regimes and weight loss (Catz, Kelly, Bogart, Benotsch, & McAuliffe, 2000);(Wing & Jeffery, 1999).

5D4. Hypothesis 4: First-Generation Status and Health, Controlling for Mediators

Hypothesis 4 was the fourth step of the mediation analysis and focused on investigating the relationships between the main independent variable (college generation status) and the dependent variable(s) – health, as measured by BMI and blood pressure while controlling for each of the proposed mediators individually. Of the 16 sub-hypotheses, none were confirmed to be supported because the proposed mediators did not mediate or partially mediate the relationship between first-generation status and BMI (first-generation status was not significantly associated with blood pressure in Mediation Step 1 and so was not tested in Mediation Step 4).

Multiple linear regressions revealed that first-generation college graduate status remained statistically significantly associated to BMI while controlling individually for several of the proposed mediators including: physical activity, fast food consumption, social support received from parents/relatives and social support provided to mother/mother figures and to father/father figures. For example, BMI increased 1.14 units for first-generation status as compared to continuing generation status and decreased 0.65 units if instrumental support was received, as compared to not received. In addition, BMI increased 1.52 units for first-generation status as compared to continuing generation status and increased 1.58 units if instrumental support was provided to one's

mother/mother figure, as compared to not provided. The proposed mediators that remained statistically significantly associated to BMI in the fourth mediation step, however, did not change or lessen the significance of first-generation college graduate status to BMI when added to the models and thus did not mediate or partially mediate the relationship between first-generation college graduate status and BMI. These findings suggest that first-generation college graduate status is a factor worth further investigation in terms of health and other life outcomes.

5E. Study Strengths and Limitations

This study has many strengths worth noting. First, the study sample draws from a large, nationally representative, diverse group of participants, which allow for comparisons across stratified groups (beyond generation status). In addition, the health indicators (BMI and blood pressure) consist of direct measurements, rather than self-report. This implies more accurate readings in comparison to self-reported information. Most importantly, this study takes an important first step in profiling first-generation college graduates in terms of demographics and health indicators – there is limited extant literature of first-generation college graduate outcomes. However, the study does not present without limitations. First, the study is cross-sectional in nature and thus causality in the associations between the potential mediators – stress, social support and health behaviors and health cannot be inferred. Second, health was measured by two important, objective indicators of health – BMI and blood pressure, but these are only two of the many components of health, for example, self-rated health, while subjective, is another proxy often used to measure health, but was not used in the current study (Idler and Benyamini, 1997). Third, while BMI is a widely used measurement tool to standardize

body fat in adults, there has been increased controversy over its use since it does not account for variations in muscle composition and bone structure, which can skew results towards obesity and misclassify people into unhealthy categories (Tomiyama, Hunger, Nguyen-Cuu, & Wells, 2016). Waist to hip ratio has been discussed as a better measure of obesity, however, doctors are not required to actually take these measurements. That practice is reflected in Add Health with waist circumference collected, but not hip circumference. So, unfortunately, waist to hip ratio was not used as a proxy for health in this study. Fourth, one dimension of social support (instrumental) was used to define social support, and while previous studies have shown the impact of instrumental support on health, emotional support has been strongly and consistently associated with good health (Strogatz, Croft, James, Keenan & Browning, et al., 1997); (Glanz et al., 2002). Fifth, there is potentially more variability to explain health of college graduates by generation status. For example, contextual variables such as time since graduation, debt, type of employment may be particularly relevant for investigating a first-generation college graduate population. Future research should consider these other potential confounding factors. Sixth, fast food and sugar-sweetened beverage consumption are not comprehensive measures for nutritional intake, but were the best available variables for nutritional health behavior. Seventh, physical activity, fast food consumption and sugar sweetened beverage consumption were dichotomized because the continuous variable versions were skewed, however, dichotomization can potentially result in loss of information about individual differences (MacCallum et al., 2002). Eighth, there is a potential for recall bias with self-reported items and all of the proposed mediator variables were self-reported, and involved recalling what participants experienced over

the past week, month or year. Ninth, income was used in both continuous and categorical forms to describe adolescent family income and current household income, respectively. Both forms were used because numeric, continuous household income was not provided in WAVE IV of Add Health, but was provided in ranges. This provided relevant income data for the current study, but limited precise comparison of household income between college graduates and parents.

5F. Contributions of Study

The findings from this study are important in that they establish the significance of being a first-generation college graduate as a relevant social status factor. As discussed in the literature review, the definition of 'socioeconomic status' (SES), has traditionally included education, income, and occupation (Adler & Newman, 2002). Of these three characteristics, education is probably the most basic socio-economic status component since it helps to develop future career and occupational options and earnings potential (Adler & Newman, 2002). Education is also critical because it helps to provide knowledge and life skills that allow for more access to information and resources that ultimately promote health (Ross & Wu, 1995). Financial well-being is a major link between education and health, but it is ability and effectiveness gained through increased education that encourage economic well-being, which positively influences health (Mirowsky & Ross, 2003). At the most basic level, parents' education indirectly affects children's outcomes, for example, academic achievement, through the impact of both parents' education and family income on where a family can live and the types of jobs the parents are likely to have (Eccles, 2005). With first-generation college graduates going into college at a financial disadvantage as evidenced by the current study, it is likely that

the kind of resources they have in terms of health access and promotion may also be at a disadvantage, and it is unclear how that may or may not change over time. The limited literature available on first-generation college graduates indicates that moving beyond college, parental education has an effect on first-generation college graduates' experience transitioning from college into the workforce (Olson, 2014). For example, findings from an analysis of data from the U.S. National Longitudinal Survey of Young Men (NLSYM) suggest that two people with the same level of education enter the labor market with similar wages and wages rise more rapidly for those with better-educated parents (Hudson & Sessions, 2011). In this sense, parental education appears to give new labor market entrants a head start that potentially continues at higher levels of experience and it is not entirely clear why, perhaps it is related to social capital. This differential impact of parental education on life outcomes of children in adulthood supported the purpose of this study to understand other potential ways in which parental education affects children in adulthood, for example, health outcomes, and possible mechanisms to explain the differences. Findings from this research help to establish and illuminate literature on first-generation college graduate outcomes by indicating a significant difference in an important health outcome: BMI.

There is a drive to increase the number of college graduates in the U.S. to help with mobility and opportunity of the nation. For example, President Barack Obama set a goal for America to have the highest proportion of college graduates in the world by 2020, and the First Lady has launched an effort to inspire every student in America to take charge of their future by completing their education past high school, whether at a professional training program, a community college, or a four-year college or university

(www.whitehouse.gov) through the Reach Higher Initiative. It is quite possible that first-generation college students, as a potentially disadvantaged population, may not have had, or have access to the same health resources as their continuing generation peers. As we look to address the needs of disadvantaged students through access and attainment policies, we may want to look at health as a way to support these graduation goals.

New funding from the Eunice Kennedy Shriver National Institute of Child Health and Human Development is supporting a fifth wave of data collection, analysis, and dissemination. The five-year project has recently begun in January 2016 and will continue through 2018 to collect social, environmental, behavioral, and biological data to track the emergence of chronic disease as the Add Health cohort moves through their fourth decade of life, with participants aged from 31-42. This effort to collect an additional wave of data on respondents into adulthood further demonstrates the importance of understanding adolescent and early adulthood contextual factors on adult health and development.

Historically, certain sets of people such as the economically poor, or racial/ethnic minorities, have experienced disparities in a variety of health outcomes, perhaps due to access and utilization of health care, in addition to a myriad of factors. The *Tackling Health Inequities Through Public Health Practice* handbook states that public health practitioners that intend to be committed to "eliminating health disparities" cannot labor in ignorance of the persistent social, political and economic forces that create and reinforce such striking patterns of residential racial segregation, educational disparities and profound wealth gaps (Hofrichter R, editor, 2006). This point of view helped to inform the purpose of the current study. According to the existing literature on education

and health discussed earlier (decreased prevalence of multiple chronic conditions among those with bachelor's degrees), and the current study's findings showing a lower prevalence of prehypertension and hypertension among college graduates as compared to national rates, policies that increase educational attainment can help improve health outcomes by decreasing prevalence of chronic illness. Further, decreasing the prevalence of chronic illness would not only help increase the quality of life of individuals, but would also have economic consequences. For example, the Joint Center for Political and Economic Studies at Johns Hopkins University estimated that eliminating health disparities for minorities would have reduced direct medical care expenditures by $229.4 billion for the years 2003-2006 (LaVeist, Gaskin, & Richard, 2009). By exploring college generation status as a new mechanism through which education affects health, the study is of public health significance as the results can be used to improve the methods and strategies currently in practice to reduce and eliminate disparities in health.

5F1. Research Implications

The findings from this study suggest that more research is necessary to further elucidate the relationship between first-generation college graduate status and BMI and what about first-generation college graduate status may be contributing to its significance to BMI. Several variables relevant to health (health behaviors such as physical activity and fast food consumption) and social support variables (financial support received from parents in the past year, financial support provided to mother/mother figure and to father/father figure) were included because the literature suggested financial barriers to college attainment experienced by first-generation college students. These variables were significantly different between first and continuing generation college graduates. The

social support variables had significant relationships to BMI, and did not mediate the relationship between first-generation status and BMI, with first-generation status maintaining the same strength of significance to health in multiple regression models controlling for the potential mediators. Social support also varied significantly between first and continuing generation college graduates with first-generation college graduates receiving less instrumental social support from family and providing more to family. These findings indicate the importance of understanding, in more depth, the role that social support plays in first-generation college graduate health, particularly when coupled with findings from previous studies indicating that low instrumental support is independently and significantly associated with high blood pressure and depressive symptoms, especially among low-income communities of color (Glanz et al., 2002; Strogatz, Croft, James, Keenan & Browning, et al., 1997);(Israel et al., 2002). A body of research among health behavior and health education researchers and practitioners has been devoted to understanding the impact that social relationships have on health. Future research should investigate the full spectrum of social support including emotional, informational and appraisal, in addition to instrumental, explored in the current study, since it was found to have a significant relationship to first-generation status and to BMI.

Stress was not found to be significantly associated to first-generation college graduate status or to health. This is despite first-generation college graduates coming from families with household incomes approximately $23,000 less than their continuing generation peers, and being more likely to receive less instrumental support from family, and provide more to family in adulthood. Future research should investigate a more comprehensive measure of stress, as the current study used a scale composed of five

mental health and social psychology items from the Add Health survey. Stress could also be investigated as a potential precursor to health behaviors, such as indicated in the Transactional Model of Stress and Coping, rather than as a mediator that happens concurrently with health behaviors as indicated in the current study's conceptual model (Glanz et al., 2002). Also, perhaps there are other well-being factors that are helping to mitigate the frequency of stress among this group - what is the role of mentors or role models? Are these students more resilient, out of necessity, than their continuing generation peers? In addition, although blood pressure was not found to differ statistically by college graduate status, mean systolic and diastolic blood pressure measures were slightly higher for first-generation college graduates. Increasing age is a risk factor for high blood pressure, so perhaps investigating blood pressure of the college graduates at an older age would be more useful in assessing the potential impact of first-generation status on that aspect of health. Further research should investigate if the differences in health (as measured by BMI) between first and continuing generation college graduates remain or grow wider later in adulthood. The advent of Wave V of Add Health allows for further research of the persistence and growth, or disappearance of the impact of first-generation status on health.

Future research should examine potential differences in health and other characteristics among potential and first-generation college graduates, for example by race and ethnicity, as first-generation college graduates were more likely to be Black or African American, American Indian or Native American, Asian or Pacific Islander and Hispanic as compared to their continuing generation peers. The current study focused on first-generation college graduates and displayed some of the financial disadvantage from

which this group starts off in college, as compared to continuing generation college graduates. Further research should look at what potential differences in health and other factors such as resilience, or stress and coping there may be between different types of first-generation students: first-generation college students who are able to persist and graduate from college, those who start college and do not finish, as well as those who are potential first-generation college graduates, meaning that they have expressed a desire to college, but wind up not going for whatever reason. What resources might be different among these three groups? Do those potential first-generation college graduates come from families with even lower household incomes than first-generation college graduates? In addition to looking at health outcomes between these first-generation college student groups, investigating what has come to be termed as "non-cognitive" skills, those other than academic knowledge that aid in post-secondary success are a future direction for research (Nagaoka et al., 2013).

5F2. Practice Implications

The findings of this study help to inform the type of support that should be provided to first-generation college students in general and those approaching graduation, in particular. The significance of first-generation college graduate status to BMI suggests the inclusion of a health or "healthy" living component to the constellation of first-generation college student programs springing up in many colleges across the country. For example, at the George Washington University (GWU), professors in the Columbian College of Arts and Sciences launched a mentorship program for first-generation freshmen in 2012. In 2013, GWU eliminated a peer-mentorship program for all freshmen, in favor of focusing on specific groups of incoming freshmen, like first-generation

students (Maher, 2015). In addition, this past fall 2015, GWU students submitted paperwork to establish a student-led first-generation college graduate student group to help support each other. Another example of a 4-year institution supporting first-generation college students is The University of Memphis First Scholars© Program which aims to dramatically improve the graduation rate of first-generation college students and prepare them for a life with self-awareness, success, and significance (Memphis.edu). This program, in addition to providing a $20,000 scholarship, was created specifically to address the holistic development of first-generation students throughout their college experience, utilizing a Steps To Success™ framework that focuses on an annual theme and targeted learning objectives. This framework guides scholars through key transitions pivotal to their college success - for example, the senior year theme is "Transitioning to the Future." The program components for senior year include: attending and leading a freshmen retreat in the fall, and one in spring for all scholars, connecting with an alumni mentors, participating in "Real Life 101" workshops to prepare for life after college, completing a capstone Individual Service Project, connecting with other First Scholars through social events and meeting monthly with the program coordinator to develop an Individual Strategic Plan (ISP) for success (Memphis.edu). These programs that provide support and resources for the transition to post-college life should be replicated across the country and should seek to include a component on health, if it is not already part of the programming. Low-cost, easy-to-use interventions such as text messaging programs based on behavioral theory are promising health promotion tools (Evans, Wallace, & Snider, 2012). They have also been discussed as a way to improve education through boosting student achievement, improving study

habits, and helping students stay on track in the transition from high school to college; once in college, they can help direct students on where to buy affordable textbooks (Castleman, 2015).

The findings regarding the difference in adolescent family income between first-generation and continuing generation college graduates, while consistent with literature on first-generation college graduates, highlight the magnitude of the difference, or what some might view as a disparity. First-generation college graduates were almost four times more likely to come from households with incomes below the median for college graduates and 6 times more likely to come from households with incomes below the national median ($32, 264) in 1994 when respondents were first surveyed (U.S. Census Bureau, 2010). An anecdotal example of how this disparity manifests among college students at an elite public university, with a historical mission to bring education within the reach of the poor, was described in a Michigan Radio Report on the State of Opportunity in Michigan (Allen, 2015). Several first-generation college students at the University of Michigan expressed how out of place one can feel as the first in their family to go to college and to come from a low-income family, when most students at the school are from middle or upper class families. The students felt as though they have to 'out' themselves as poor, often encountering awkward conversations explaining their family backgrounds to others when asked what their parents do, or where they went to college (State of Opportunity, 2015). One student remarked: "I think the university is aware that there are many low-income students here, but I don't think they realize how uncomfortable we are (State of Opportunity, 2015)." These student sentiments are important to pay attention to in light of a main finding from the *American Freshman*

Survey, a report conducted annually over the past 50 years that showed that emotional health was at its lowest point in over 30 years (Eagan, Stolzenberg, Ramirez & Aragon, et al., 2014). Data was collected from about 153,000 full-time, first-year students at 227 four-year public and private institutions in 2014. The First Generation student group at the University of Michigan began raising money last year for a student center on campus so that current first-generation students can go for help and guidance and be reminded that, "there are first-generation students on campus, and they deserve to be there (State of Opportunity, 2015)." Tufts University has developed initiatives to support first-generation college students such as *Tufts F1RST,* a student-led initiative of the First Generation College Student Council aimed to unite and champion pride within the Tufts first-generation community. The council was first developed to create a community of support and to develop a network of resources for Tufts University's first-generation population, in addition to reaching out to future generations through high school student mentorship (Jonathan M. Tisch College of Citizenship and Public Service, 2016). The findings of the current study, showing decreased social, instrumental support among first-generation college graduates and increased BMI as compared to their continuing generation peers, support the development and maintenance of such programs to support first-generation college students/graduates in terms of health and a broad array of social support including instrumental, emotional, appraisal and informational support. Alternatively, the findings of this study also suggest taking existing student health programs at universities and having those programs incorporate first-generation college student needs and strengths if there are limited resources to develop an entirely new and separate program. For example, an existing student health program could have office

hours specifically targeted to first-generation college students to help, where they can talk with a counselor or other first-generation college students as a form of social support, or to gain information on health promotion.

5F3. Policy Implications

Education is increasingly being recognized as a social determinant of health (U.S. Department of Health and Human Services, 2016). The findings of this study indicate a disparity in adolescent family income of first-generation as compared to continuing generation college graduates and differences in instrumental social support between the two groups. This is particularly interesting since both groups of college graduates appear similarly matched in terms of current household income. Education, in this sense, is similar to an income equalizer, but not necessarily a wealth equalizer since first-generation college graduates start college with a disparity in family income that is later potentially compounded by the need to support previous generations (parents) and supporting future generations (children). These findings suggest policies to assist with reducing college costs and college debt for first-generation college graduates since they are more likely to have financial obligations to family while receiving less instrumental support from them, for example, for the purchase of a house. In January 2015, President Obama announced his $60 billion national plan to make 2-year community colleges free for responsible students. In addition to calls to make 2-year community colleges free, Dr. Michael Lomax, CEO of the United Negro College Fund suggested that we also invest further in Pell Grants, because students can take them to any institution they think is right for them (NPR, 2015). Based on the results indicating that first-generation college graduates are at a financial disadvantage before they start college and after they finish, as

compared to continuing generation college graduates, strategies to make going to college more affordable in the first place, like free or low-cost college are necessary. Since first-generation college graduates are more likely to have to work to cover financial obligations, providing them with better paying work study jobs might also be effective in helping them meet their financial obligations while staying in school. Strategies to reduce student loan debt or help graduates with the burden of paying off their debt would also be helpful, particularly for the students who are able to graduate. The attrition and lower graduation rates of first-generation colleges, however, suggest that the increased affordability upfront would have the most impact on student retention.

The Tennessee Promise program is a statewide effort to make college more accessible to students. One of the first of its kind, Tennessee Promise provides two years of tuition-free attendance at community or technical colleges to eligible high school seniors (Tennesseepromise.gov, 2016). Tennessee Promise aims to remove the financial burden of attending college through the scholarship component, but is also a mentorship program that includes individual guidance from a mentor who assists students as they navigate the college admissions process. In 2015, the Governor of New York, Andrew Cuomo presented the state's "Opportunity Agenda," a comprehensive package of legislative reforms, state actions, and public investments aimed to restore economic opportunity, improve and reform the education system, and restore the public's confidence and trust in the justice system for all New Yorkers (NY.gov, 2015). As part of this agenda, the governor unveiled the "Get on Your Feet" loan forgiveness program for graduates that attended college in New York, continue to live in the state and earn less than $50,000 annually (NYS Higher Education Services Corporation, 2016). The

program ensures that 100% of a graduate's loan payments are covered for two years so that they are not overwhelmed with debt repayments while working to get situated in today's sometimes difficult, job market. At the city level, New York's pilot CUNY program, Accelerated Study in Associate Program, or ASAP was singled out by the President for its success, the program provides tuition aid, textbooks, commuting money, and one-on-one mentoring to select students (Edelman & Hay, 2015; CUNY.edu, 2016). Proposals, on the national level to make college free or more affordable are supported by the findings regarding receipt and provision of support of first-generation college graduates.

The findings of the current study also have implications for national policies concerning college recruitment and attainment of first-generation college students. While the current study focuses on college graduates and health, as mentioned in the literature review, first-generation college students struggle with retention in college and graduate at lower rates than continuing generation college students. The demographic profile of first-generation college graduates revealed they come from families with a median household income of $40,000 – $23,000 lower than the family household income of continuing generation college graduates, and the difference is statistically significantly different. It is also $11,000 lower than the median for college graduates as a whole ($51,000). This finding begs the question – what about the first-generation college students who are unable to make it to graduation? What about the potential first-generation college graduates who want to go to college but don't know where to start and have financial barriers? There is a growing effort to rethink the college admissions process and promote greater ethical engagement among aspiring students, reduce excessive achievement

pressure, and level the playing field for economically disadvantaged students (Making Caring Common Project, Harvard Graduate School of Education, 2016). In *Turning the Tide*, a report by a coalition of leaders from the nation's top colleges, led by Harvard University, colleges appear to recognize their role in social mobility, particularly how many admissions measures favor students from affluent families (Bruni, 2016). For example, a growing number of universities have recently made the SATs optional as part of the college admissions process since students from economically disadvantaged backgrounds typically do not have the resources to take expensive prep courses for the exam and data has shown that SAT scores correlate with family income (Zumbrun, 2014). The findings of this study support efforts to continue the dialogue on figuring out solutions and making recommendations, like those discussed in *Turning the Tide*, to address decreased social mobility and increasing income inequality.

5G. Conclusion

Education is an important social determinant of health. By exploring college generation status as a new mechanism through which education affects health, the study is of public health significance as the findings indicate first-generation college graduate status as a factor relevant to health. First-generation college graduate status, as hypothesized, was found to have a significant association with BMI; first-generation college graduates had statistically significantly higher mean BMIs than continuing generation college graduates. Physical activity and fast food consumption, like hypothesized differed between first and continuing generation college graduates. In addition, social support received from parent and family, as well as provided to parent/ parent figures, as hypothesized, differed significantly between first and continuing

generation college graduates. Although physical activity and social support variables were found to be significantly associated with BMI, they were not found to mediate the relationship between first-generation college graduate status and BMI, but rather had direct effects on BMI. The findings suggest the need for further research on how the relationships between first-generation college graduate status and health potentially change or remain the same later in adulthood.

Although there was a statistically significant difference in BMI between first-generation and continuing generation college graduates, the findings from this study on college graduates overall indicate lower rates of obesity, prehypertension and hypertension, and are consistent with previous research on educational attainment and health and that emphasize the importance of a four-year college degree. It appears the most powerful instrument of economic mobility for low-income Americans is a four-year college degree (Haskins, 2008). For example, if a child is born into a family in the lowest economic quintile ($28,000 or less), and doesn't get a college degree, he/she only has a 14% chance of ending up in one of the top two quintiles, and a 45% chance of never making it out of the bottom bracket (Haskins, 2008). However, if he/she does earn a four-year degree, his/her trajectory changes completely with a 40% chance of making it into one of the top two quintiles, and just a 16% chance of remaining at the bottom (Haskins, 2008).

As discussed in the literature review, even when many of the characteristics that distinguished first-generation college students from their peers were controlled for, such as socioeconomic status, institution type, and attendance status, first-generation student status continued to have a negative effect on persistence and attainment of a college

degree (U.S. Department of Education et al., 1998). The findings from this study show that first-generation status had a similar effect on BMI and on health behaviors and social support. The findings indicated that first-generation college graduates come from families with a median income of $40,000 when they were adolescents, a statistically significantly lower amount than the $63,000 median of their continuing generation peers. The adolescent family income "disadvantage" appears to remain in first-generation college graduates' adulthood in that a smaller percent of first-generation college graduates receive financial support from their parents, but a larger portion provide financial support to their parents as compared to their continuing generation peers. This finding is important in light of the finding that first-generation college graduates are similarly matched to continuing generation peers in terms of income distribution in adulthood with most of both first-generation (22%) and continuing generation and (27%) college graduates in the $50,000 - $74,999 category.

A 2015 report, *Indicators of Higher Education Equity in the United States* revealed that individuals from families in the top family income quartile were over eight times as likely to obtain a bachelor's degree by age 24 as those in the bottom family income quartile (77% percent as compared to 9%) which is at odds with a nation with a purported ethos of mobility and opportunity (The Pell Institute & Penn AHEAD, 2015). The current study shows that even those who are able to persist and attain a college degree, and are the first in their family to go to college, have a significantly different health outcome in BMI, compared to their continuing generation counterparts. The *Education Equity* report emphasizes the need for a comprehensive approach that recognizes the importance of improving college affordability, academic readiness,

information, and support, and roles of multiple stakeholders from the federal government, state governments, and colleges and universities to help close the gaps in higher education attainment. It also recognizes that a comprehensive approach to closing gaps recognizes the role of data and research in informing understanding of the appropriate policies and practices needed – the current study contributes to this body of research. This is the first study, to the author's knowledge and to date, to use a nationally representative dataset (Add Health) to generate a profile of first-generation college graduates and the first of its kind to understand the health outcomes of first-generation college graduates in adulthood.

References

Adler, N. E., & Newman, K. (2002). Socioeconomic Disparities In Health: Pathways And Policies. *Health Affairs*, *21*(2), 60–76. http://doi.org/10.1377/hlthaff.21.2.60

Allen, J. (2015, January 30). Report: Poor, first-generation students feel out of place on U-M's campus. *Michigan Live.* Retrieved from: http://www.mlive.com/news/ann-arbor/index.ssf/2015/01/report_poor_first_generation_s.html

Andersen, R. E., Crespo, C. J., Bartlett, S. J., Cheskin, L. J., & Pratt, M. (1998). Relationship of Physical Activity and Television Watching With Body Weight and Level of Fatness Among Children: Results From the Third National Health and Nutrition Examination Survey. *JAMA*, *279*(12), 938. http://doi.org/10.1001/jama.279.12.938

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173.

Baum, S., Payea, K. (2005). Education Pays Update: A Supplement to Education Pays 2004: The Benefits of Higher Education for Individuals and Society, College Board.

Bergland, C. (2014, February 12). Chronic Stress Can Damage Brain Structure and Connectivity | Psychology Today. Retrieved February 28, 2016, from https://www.psychologytoday.com/blog/the-athletes-way/201402/chronic-stress-can-damage-brain-structure-and-connectivity

Board, A. D. A. M. E. (2014). High blood pressure. *PubMed Health*. Retrieved from http://www.ncbi.nlm.nih.gov/books/PMH0001502/

Braveman, P. A., Egerter, S. A., & Mockenhaupt, R. E. (2011). Broadening the FocusThe Need to Address the Social Determinants of Health. *American Journal of Preventive Medicine*, *40*(1), S4–S18. http://doi.org/10.1016/j.amepre.2010.10.002

Brody, G.H., Yu, T., Chen, E., Miller, G. E., Kogan, S.M. & Beach, S. R. H. (2013). Is Resilience Only Skin Deep?: Rural African Americans' Socioeconomic Status-Related Risk and Competence in Preadolescence and Psychological Adjustment and Allostatic Load at Age 19. *Psychological Science, 24*(7), 1285-1293.

Bronfenbrenner, U. (1979). The ecology of human development: Experiments by design and nature.

Bruni, F. (2016, January 16). Rethinking College Admissions. *The New York Times.* Retrieved from: http://www.nytimes.com/2016/01/20/opinion/rethinking-college-admissions.html

Castleman, B. L., & Page, L. C. (2015). Summer nudging: Can personalized text messages and peer mentor outreach increase college going among low-income high school graduates?. *Journal of Economic Behavior & Organization*, *115*, 144-160.

Catz, S. L., Kelly, J. A., Bogart, L. M., Benotsch, E. G., & McAuliffe, T. L. (2000). Patterns, correlates, and barriers to medication adherence among persons prescribed new treatments for HIV disease. *Health Psychology*, *19*(2), 124–133. http://doi.org/10.1037/0278-6133.19.2.124

Cawley, J., & Meyerhoefer, C. (2012). The medical care costs of obesity: An instrumental variables approach. *Journal of Health Economics*, *31*(1), 219–230. http://doi.org/10.1016/j.jhealeco.2011.10.003

CDC. (2015a). About Adult BMI | Assessing Your Weight | Healthy Weight | DNPAO | CDC. Retrieved December 18, 2015, from http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html#Definition

CDC. (2015b). Fact Sheet - Current Cigarette Smoking Among Adults in the United States - Smoking & Tobacco Use. Retrieved February 22, 2016, from http://www.cdc.gov/tobacco/data_statistics/fact_sheets/adult_data/cig_smoking/

CDC. (2015c). High Blood Pressure Fact Sheet|Data & Statistics. Retrieved February 22, 2016, from http://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_bloodpressure.htm

Center for Student Opportunity. (2014). I'm First (Imfirst.org). Retrieved from: http://www.imfirst.org/center-for-student-opportunity/

Chetty, S., Friedman, A. R., Taravosh-Lahn, K., Kirby, E. D., Mirescu, C., Guo, F., … Kaufer, D. (2014). Stress and glucocorticoids promote oligodendrogenesis in the adult hippocampus. *Mol Psychiatry*, *19*(12), 1275–1283.

Cutler, D. M., & Lleras-Muney, A. (2006). *Education and health: evaluating theories and evidence*. National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w12352

Davis-Kean, P. E. (2005). The Influence of Parent Education and Family Income on Child Achievement: The Indirect Role of Parental Expectations and the Home Environment. *Journal of Family Psychology*, *19*(2), 294–304. http://doi.org/10.1037/0893-3200.19.2.294

DeAngelo, L., Franke, R., Hurtado, S., Pryor, J. H., & Tran, S. (2011). Completing college: Assessing graduation rates at four-year colleges.

DeVellis, R. F. (2012). *Scale development: theory and applications* (3rd ed). Thousand Oaks, Calif: SAGE.

Dubow, E. F., Boxer, P., & Huesmann, L. R. (2009). Long-term Effects of Parents' Education on Children's Educational and Occupational Success: Mediation by Family Interactions, Child Aggression, and Teenage Aspirations. *Merrill-Palmer Quarterly*, *55*(3), 224–249. http://doi.org/10.1353/mpq.0.0030

Eagan, K., Stolzenberg, E. B., Ramirez, J. J., Aragon, M. C., Suchard, M. R., & Hurtado, S. (2014). The American freshman: National norms fall 2014. Los Angeles: Higher Education Research Institute, UCLA.

Eccles, J. S. (2005). Influences of parents' education on their children's educational attainments: the role of parent and child perceptions. *London Review of Education*, *3*(3), 191–204. http://doi.org/10.1080/14748460500372309

Edelman, S. & Hay, A. (2015, January, 2015). Free community college plan may raise CUNY's graduation rates. *New York Post.* Retrieved from: http://nypost.com/2015/01/24/free-community-college-plan-may-raise-cunys-graduation-rates/

Egerter, S., Braveman, P., Sadegh-Nobari, T., Grossman-Kahn, R., & Dekker, M. (2009). Education matters for health. *Princeton, NJ: RWJF Commission to Build a Healthier America*.

Evans, W. D., Wallace, J. L., & Snider, J. (2012). Pilot evaluation of the text4baby mobile health program. *BMC Public Health*, *12*(1), 1–10. http://doi.org/10.1186/1471-2458-12-1031

Finkelstein, E. A., Trogdon, J. G., Cohen, J. W., & Dietz, W. (2009). Annual medical spending attributable to obesity: payer-and service-specific estimates. *Health Affairs*, *28*(5), w822–w831.

Ford, E. S., Croft, J. B., Posner, S. F., Goodman, R. A., & Giles, W. H. (2013). Co-Occurrence of Leading Lifestyle-Related Chronic Conditions Among Adults in the United States, 2002-2009. *Preventing Chronic Disease*, *10*. http://doi.org/10.5888/pcd10.120316

Glanz, K., Rimer, B. K., & Lewis, F. M. (Eds.). (2002). *Health behavior and health education: theory, research, and practice* (3rd ed). San Francisco: Jossey-Bass.

Harris, K. M., Halpern, C. T., Whitsel, E., Hussey, J., Tabor, J., Entzel, P., & Udry, J. R. (2009). The national longitudinal study of adolescent health: Research design. *Available at h ttp://www. cpc. unc. edu/pr ojects/addhealth/design*.

Haskins, R. (2008). Education and economic mobility. *The Economic Mobility Project*.

Heidenreich, P. A., Trogdon, J. G., Khavjou, O. A., Butler, J., Dracup, K., Ezekowitz, M. D., ... & Lloyd-Jones, D. M. (2011). Forecasting the future of cardiovascular disease in the United States a policy statement from the American heart association. Circulation, 123(8), 933-944.

Hofrichter, R. (Ed.). (2006). *Tackling health inequities through public health practice: A handbook for action*. National Association of County & City Health Officials, the Ihgham County Health Department.

Horn, L., & Nuñez, A.-M. (2000). *Mapping the road to college: First-generation students' math track, planning strategies, and context of support*. DIANE Publishing. Retrieved from http://books.google.com/books?hl=en&lr=&id=PO0O2mYNc2QC&oi=fnd&pg=PR3&dq=%22of+Educational+Research+and%22+%22students+whose+parents+have%22+%22benefit+from+their+parents%E2%80%99+experiences%22+%22report+compares+the+high+school%22+%22taking,+beginning+in+the+eighth+grade.%22+%22after+controlling+for+measures+of%22+&ots=APOoBxiIWm&sig=qMpM90RSD0yFvjFy0LoEbM5CX9o

Horn, L. J., & Zahn, L. (2001). From Bachelor's Degree to Work: Major Field of Study and Employment Outcomes of 1992-93 Bachelor's Degree Recipients Who Did Not Enroll in Graduate Education by 1997. Statistical Analysis Report. Postsecondary Education Descriptive Analysis Reports.

House, J.S. (1981). *Work Stress and Social Support.* Reading, Mass: Addison-Wesley.

House, J. S., Umberson, D., & Landis, K. R. (1988). Structures and Processes of Social Support. *Annual Review of Sociology*, *14*(1), 293–318. http://doi.org/10.1146/annurev.so.14.080188.001453

Huber, C. T. (2010). Social class experiences of working-class students: Transitioning out of college. (Doctoral Dissertation). Retrieved from ProQuest Dissertations and Theses A&I.

Hudson, J., & Sessions, J. G. (2011). Parental education, labor market experience and earnings: New wine in an old bottle? *Economics Letters*, *113*(2), 112–115. http://doi.org/10.1016/j.econlet.2011.05.053

Idler, E. L., & Benyamini, Y. (1997). Self-rated health and mortality: a review of twenty-seven community studies. *Journal of health and social behavior*, 21-37.

Institute for Higher Education Policy. (2012). Issue Brief: Supporting First-Generation College Students Through Classroom-Based Practices. Washington, DC: Institute for Higher Education Policy.

Israel, B. A., Farquhar, S. A., Schulz, A. J., James, S. A., & Parker, E. A. (2002). The Relationship between Social Support, Stress, and Health among Women on Detroit's East Side. *Health Education & Behavior*, *29*(3), 342–360. http://doi.org/10.1177/109019810202900306

Jonathan M. Tisch College of Citizenship and Public Service. (2016). Making the Path as they Walk. Retrieved March 6, 2016, from http://activecitizen.tufts.edu/blog/2014/04/01/making-the-path-as-they-walk/

Keenan, N. L., & Shaw, K. M. (2011). Coronary heart disease and stroke deaths-United States, 2006. MMWR Surveill Summ, 60(Suppl), 62-6.

Kent, A. (2009). Youth from Low-Income Families. Vulnerable Youth and the Transition to Adulthood. ASPE Research Brief. *US Department of Health and Human Services*. Retrieved from http://eric.ed.gov/?id=ED508239

Kvaavik, E., Glymour, M., Klepp, K.-I., Tell, G. S., & Batty, G. D. (2012). Parental education as a predictor of offspring behavioural and physiological cardiovascular disease risk factors. *The European Journal of Public Health*, *22*(4), 544–550. http://doi.org/10.1093/eurpub/ckr106

LaVeist, T. A., Gaskin, D. J., & Richard, P. (2009). The economic burden of health inequalities in the United States. Retrieved from http://hsrc.himmelfarb.gwu.edu/sphhs_policy_facpubs/225/

Link, B. G., & Phelan, J. (1995). Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior*, *Spec No*, 80–94.

MacCallum, R. C., Zhang, S., Preacher, K. J., & Rucker, D. D. (2002). On the practice of dichotomization of quantitative variables. *Psychological Methods*, *7*(1), 19–40. http://doi.org/10.1037//1082-989X.7.1.19

Mahan, D. (2010). The Four-Year Experience of First-Generation Students at a Small Independent University: Engagement, Student Learning, and Satisfaction. (Doctoral Dissertation, University of Louisville).

Maher, N. (2015, November 4). In new group, first-generation students turn to each other for support. *GW Hatchet*. Retrieved from: http://www.gwhatchet.com/2015/11/04/in-new-group-first-generation-students-turn-to-each-other-for-support/

Mayo Clinic (2014). Diseases and Conditions: High blood pressure (hypertension). Retrieved from: http://www.mayoclinic.org/diseases-conditions/high-blood-pressure/basics/risk-factors/con-20019580

McCullough, M. B., & Marks, A. K. (2014). The immigrant paradox and adolescent obesity: Examining health behaviors as potential mediators. *Journal of Developmental & Behavioral Pediatrics*, *35*(2), 138–143.

McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education & Behavior*,*15*(4), 351-377.

Miller, M. A. (2008). The privileges of the parents. *Change: The Magazine of Higher Learning*, *40*(1), 6–7.

Mirowsky, J., & Ross, C. E. (2003). *Education, social status, and health*. New York: A. de Gruyter.

Mistry, R. S., Biesanz, J. C., Chien, N., Howes, C., & Benner, A. D. (2008). Socioeconomic status, parental investments, and the cognitive and behavioral outcomes of low-income children from immigrant and native households. *Early Childhood Research Quarterly*, *23*(2), 193–212. http://doi.org/10.1016/j.ecresq.2008.01.002

Mistry, R. S., Vandewater, E. A., Huston, A. C., & McLoyd, V. C. (2002). Economic Well-Being and Children's Social Adjustment: The Role of Family Process in an Ethnically Diverse Low-Income Sample. *Child Development*, *73*(3), 935–951.

Mozzafarian D, Benjamin EJ, Go AS, et al. Heart Disease and Stroke Statistics-2015 Update: a report from the American Heart Association. *Circulation*. 2015;e29-322.

Murphy, S. L., Xu, J., Kochanek, K. D., & others. (2012). National vital statistics reports. *National Vital Statistics Reports*, *60*(4), 1.

Nagaoka, J., Farrington, C. A., Roderick, M., Allensworth, E., Keyes, T. S., Johnson, D. W., & Beechum, N. O. (2013). Readiness for College: The Role of Noncognitive Factors and Context. *Voices in Urban Education*, *38*, 45–52.

National Bureau of Economic Research. (2010). US Business Cycle Expansions and Contractions. Retrieved from: http://www.nber.org/cycles.html

National Heart, Lung and Blood Institute, National Institutes of Health (2015). Description of High Blood Pressure. Retrieved from: http://www.nhlbi.nih.gov/health/health-topics/topics/hbp

National Public Radio (NPR), Siegel, R. (2015). UNCF CEO: Obama's Community College Plan A 'Blunt Instrument'. Retrieved from: http://www.npr.org/2015/02/06/384345838/uncf-ceo-obamas-community-college-plan-a-blunt-instrument

New York State, Higher Education Services Corporation (2016). NYS Get on Your Feet Loan Forgiveness Program. Retrieved from: https://www.hesc.ny.gov/repay-your-loans/repayment-options-assistance/loan-forgiveness-cancellation-and-discharge/nys-get-on-your-feet-loan-forgiveness-program.html

Nwankwo, Yoon, Burt, & Gu. (2013). Hypertension Among Adults in the United States: National Health and Nutrition Examination Survey, 2011–2012. Retrieved from http://198.246.124.29/nchs/data/databriefs/db133.pdf

NYS Higher Education Services Corporation. (2016). NYS Get on Your Feet Loan Forgiveness Program Fact Sheet. Retrieved February 22, 2016, from https://www.hesc.ny.gov/repay-your-loans/repayment-options-assistance/loan-forgiveness-cancellation-and-discharge/nys-get-on-your-feet-loan-forgiveness-program.html

Ogden, C. L., & Carroll, M. D. (2010). Prevalence of overweight, obesity, and extreme obesity among adults: United States, trends 1960–1962 through 2007–2008. *National Center for Health Statistics*, *6*, 1–6.

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of Childhood and Adult Obesity in the United States, 2011-2012. *JAMA*, *311*(8), 806. http://doi.org/10.1001/jama.2014.732

Olson, J. S. (2014). Opportunities, Obstacles, and Options: First-Generation College Graduates and Social Cognitive Career Theory. *Journal of Career Development*, *41*(3), 199–217. http://doi.org/10.1177/0894845313486352

Olson, J. S. (2010). *Chasing a passion: The early-career lived experience of first-generation college graduates* (Doctoral dissertation, The Pennsylvania State University).

Pascarella, E. T., Pierson, C. T., Wolniak, G. C., & Terenzini, P. T. (2004). First-generation college students: Additional evidence on college experiences and outcomes. *Journal of Higher Education*, 249–284.

The Pell Institute for the Study of Opportunity in Higher Education, PennAhead Alliance for Education and Democracy. (2015). Indicators of Higher Education Equity in the United States: 45 Year Trend Report. Retrieved from: http://www.pellinstitute.org/downloads/publications-Indicators_of_Higher_Education_Equity_in_the_US_45_Year_Trend_Report.pdf

Ross, C. E., & Mirowsky, J. (2011). The interaction of personal and parental education on health. *Social Science & Medicine*, *72*(4), 591–599. http://doi.org/10.1016/j.socscimed.2010.11.028

Ross, C. E., & Wu, C. (1995). The Links Between Education and Health. *American Sociological Review*, *60*(5), 719. http://doi.org/10.2307/2096319

Saenz, V. B., Hurtado, S., & Barrera, D. Wolf, D., & Yeung, F. (2007). *First in My Family: A Profile of First-Generation College Students at Four-Year Institutions Since 1971*.

State of Opportunity, Guerra, J. (2015). Coming out as poor at an elite university. *Michigan Radio*. Retrieved from: http://stateofopportunity.michiganradio.org/about-us

Streiner, D. L. (2002). Breaking up is hard to do: the heartbreak of dichotomizing continuous data. *Canadian Journal of Psychiatry*, *47*(3), 262-266.

Strogatz, D. S., Croft, J. B., James, S. A., Keenan, N. L., Browning, S. R., Garrett, J. M., & Curtis, A. B. (1997). Social support, stress, and blood pressure in black adults. *Epidemiology*, *8*(5), 482-487. 10.1097/00001648-199709000-00002

Terenzini, P. T., Springer, L., Yaeger, P. M., Pascarella, E. T., & Nora, A. (1996). First-generation college students: Characteristics, experiences, and cognitive development. *Research in Higher education*, *37*(1), 1-22.

Thoits, P. A. (2010). Stress and Health: Major Findings and Policy Implications. *Journal of Health and Social Behavior*, *51*(1 Suppl), S41–S53. http://doi.org/10.1177/0022146510383499

Tomiyama, A. J., Hunger, J. M., Nguyen-Cuu, J., & Wells, C. (2016). Misclassification of cardiometabolic health when using body mass index categories in NHANES 2005-2012. *Int J Obes*. Retrieved from http://dx.doi.org/10.1038/ijo.2016.17

U.S. Census Bureau. (2010). Income and Poverty Statistics: 1994. Retrieved February 22, 2016, from https://www.census.gov/hhes/www/income/data/incpovhlth/1994/table1.html

U.S. Census Bureau, Noss, A. (2010). Household Income for States: 2008 and 2009. *American Community Survey Briefs.* Retrieved from: https://www.census.gov/prod/2010pubs/acsbr09-2.pdf

U.S. Census Bureau. (2016). Residential Vacancies and Homeownership in the Fourth Quarter 2015. U.S. Washington, DC: Department of Commerce. Retrieved from: http://www.census.gov/housing/hvs/files/currenthvspress.pdf

U.S. Department of Education, Choy, S. (2001). Students Whose Parents Did Not Go to College: Postsecondary Access, Persistence, and Attainment. Findings from the Condition of Education, 2001.

U.S. Department of Education, National Center for Education Statistics. (2015). *The Condition of Education 2015* (NCES 2015–144),Educational Attainment.

U.S. Department of Education, Nunez, A.-M., & Cuccaro-Alamin, S. (1998). *First-Generation Students: Undergraduates Whose Parents Never Enrolled in Postsecondary Education.* (NCES 98-082). Washington, D.C.: National Center for Health Statistics. Retrieved from http://eric.ed.gov/?id=ED420235

U.S. Department of Health and Human Services. (2016). Healthy People 2020: Social Determinants of Health. Retrieved from: https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health#one

Ward, B. W., Schiller, J. S., & Goodman, R. A. (2014). Multiple Chronic Conditions Among US Adults: A 2012 Update. *Preventing Chronic Disease*, *11*. http://doi.org/10.5888/pcd11.130389

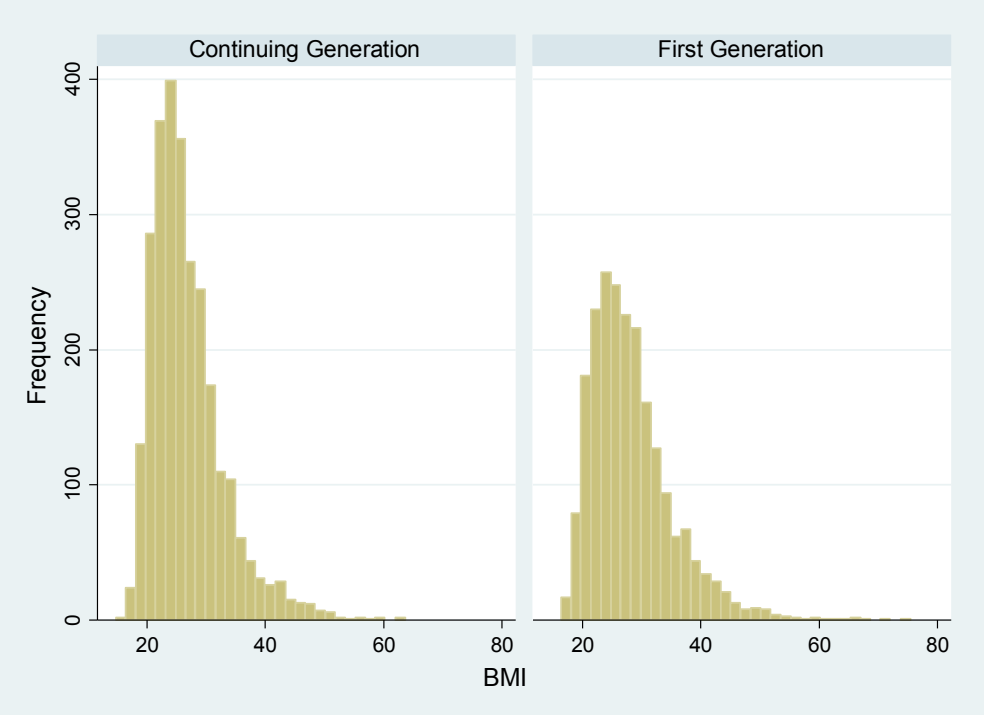
Wing, R. R., & Jeffery, R. W. (1999). Benefits of recruiting participants with friends and increasing social support for weight loss and maintenance. *Journal of Consulting and Clinical Psychology*, *67*(1), 132–138. http://doi.org/10.1037/0022-006X.67.1.132

Wrinkleby, M. A., Jatulis, D. E., & Frank, E. (1992). and Stephen P. Fortmann, MD. *Health*, *82*(816), 20.

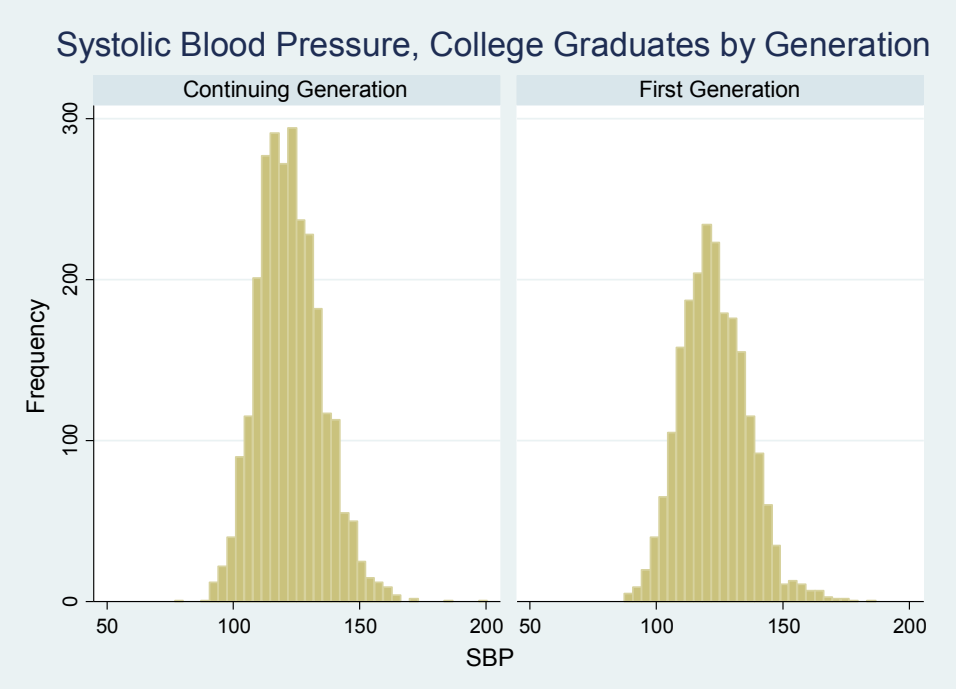
Zimmerman, E., & Woolf, S. H. (2014). Understanding the Relationship Between Education and Health. Retrieved from http://www.commed.vcu.edu/Chronic_Disease/2015/education_healthlink.pdf

Zumbrun, J. (2014, October 7). SAT Scores and Income Inequality: How Wealthier Kids Rank Higher. *The Wall Street Journal*. Retrieved from: http://blogs.wsj.com/economics/2014/10/07/sat-scores-and-income-inequality-how-wealthier-kids-rank-higher/

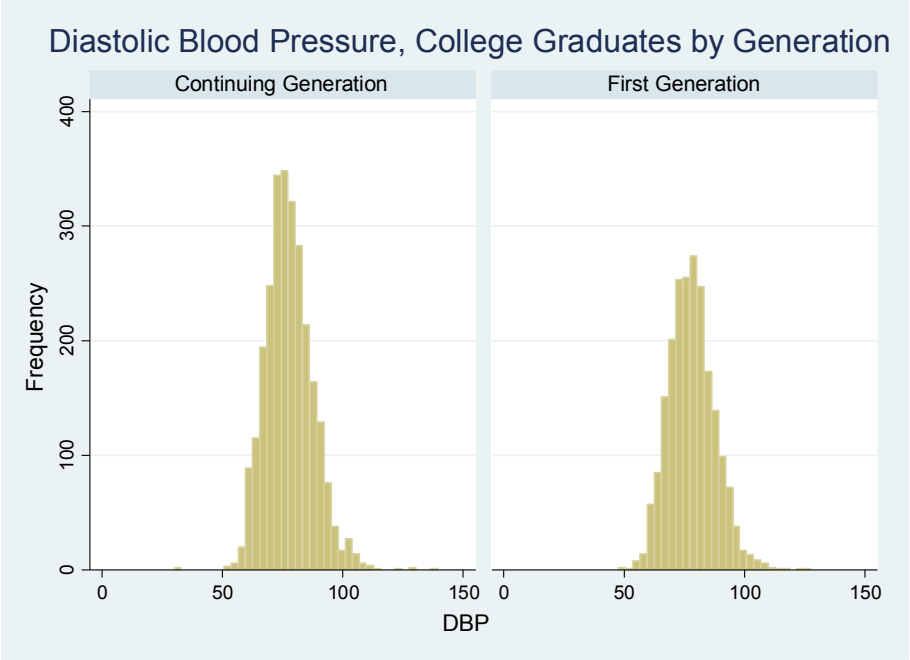
Appendix



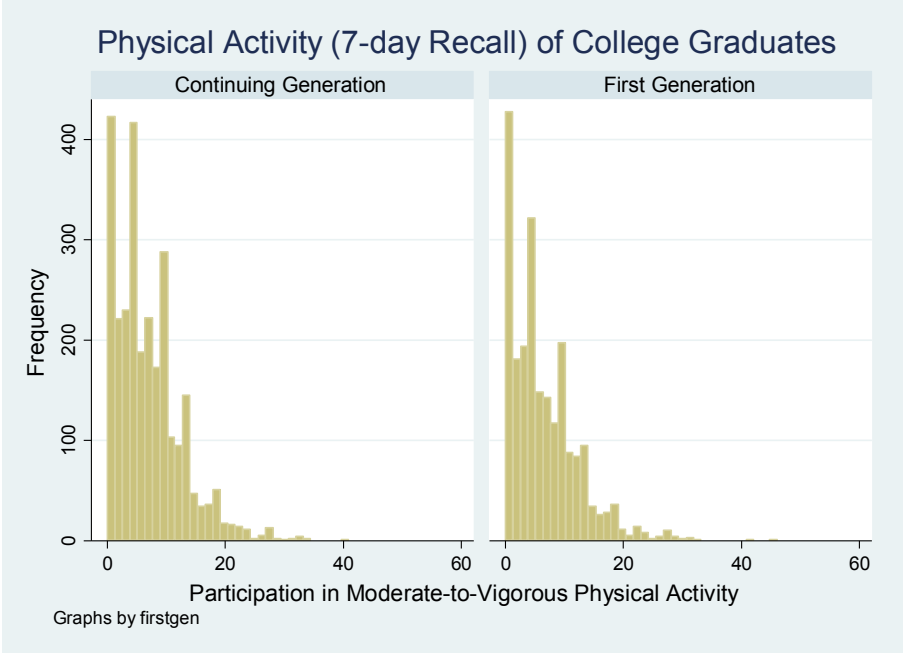
Appendix1. BMI by College Graduate Status



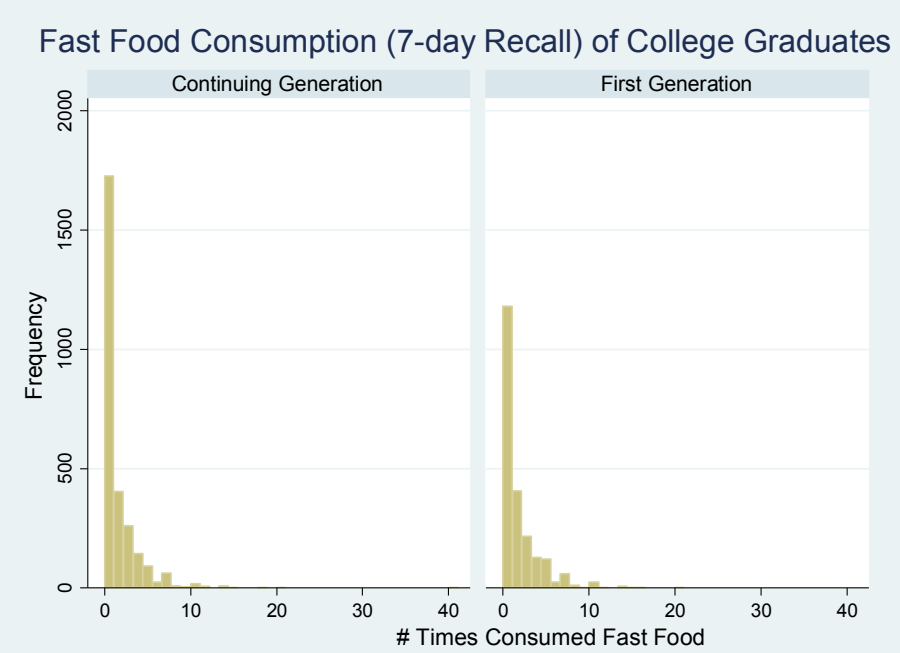
Appendix 2. Systolic Blood Pressure by College Graduate Status



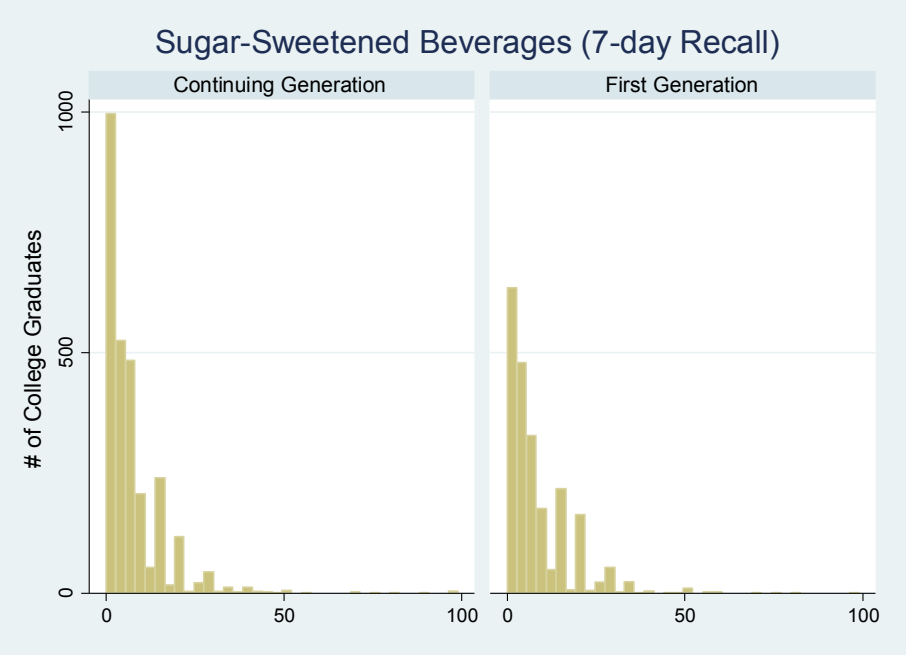
Appendix 3. Diastolic Blood Pressure by College Graduate Status



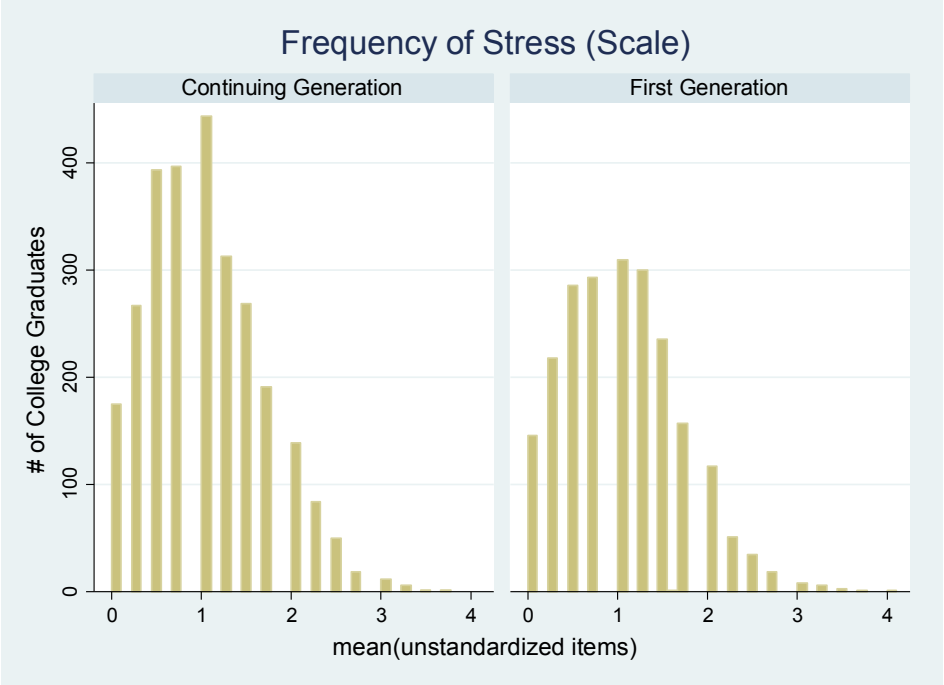
Appendix 4. Physical Activity by College Graduate Status



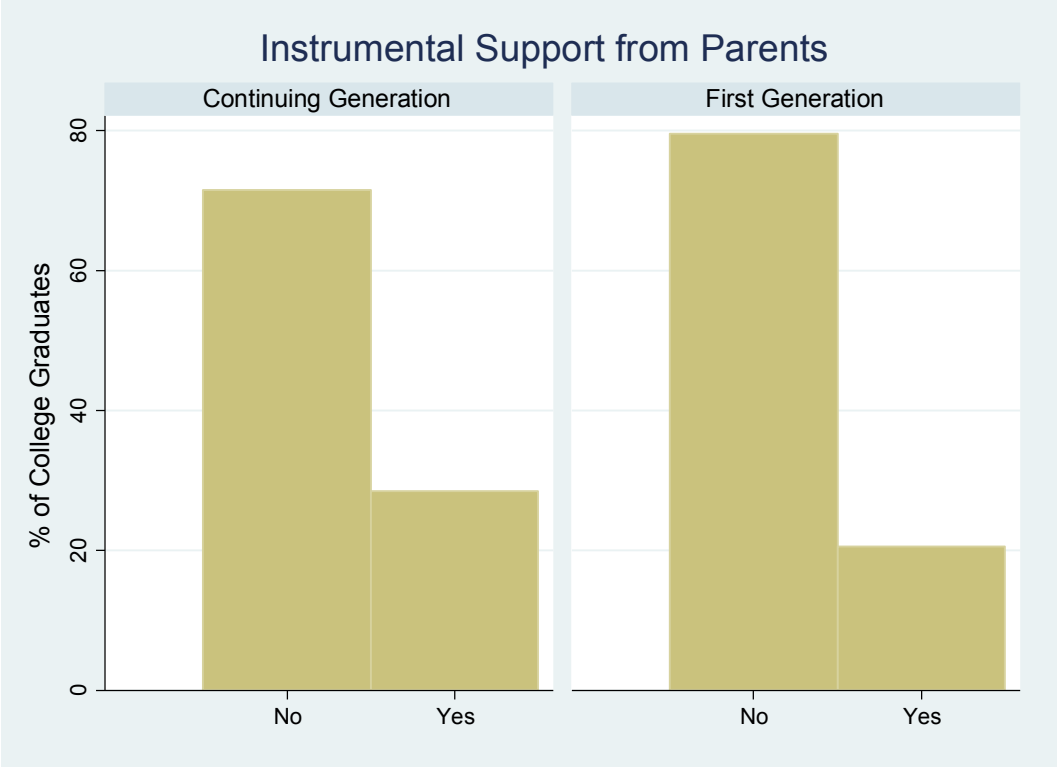
Appendix 5. Fast Food Consumption by College Graduate Status



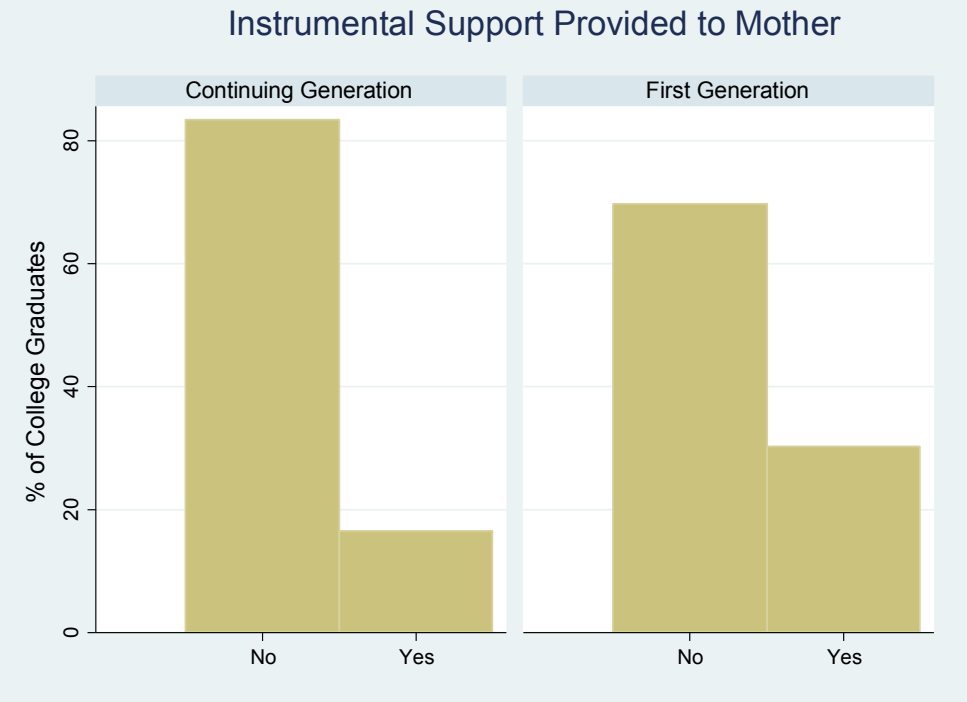
Appendix 6. Sugar-Sweetened Beverage Consumption by College Graduate Status



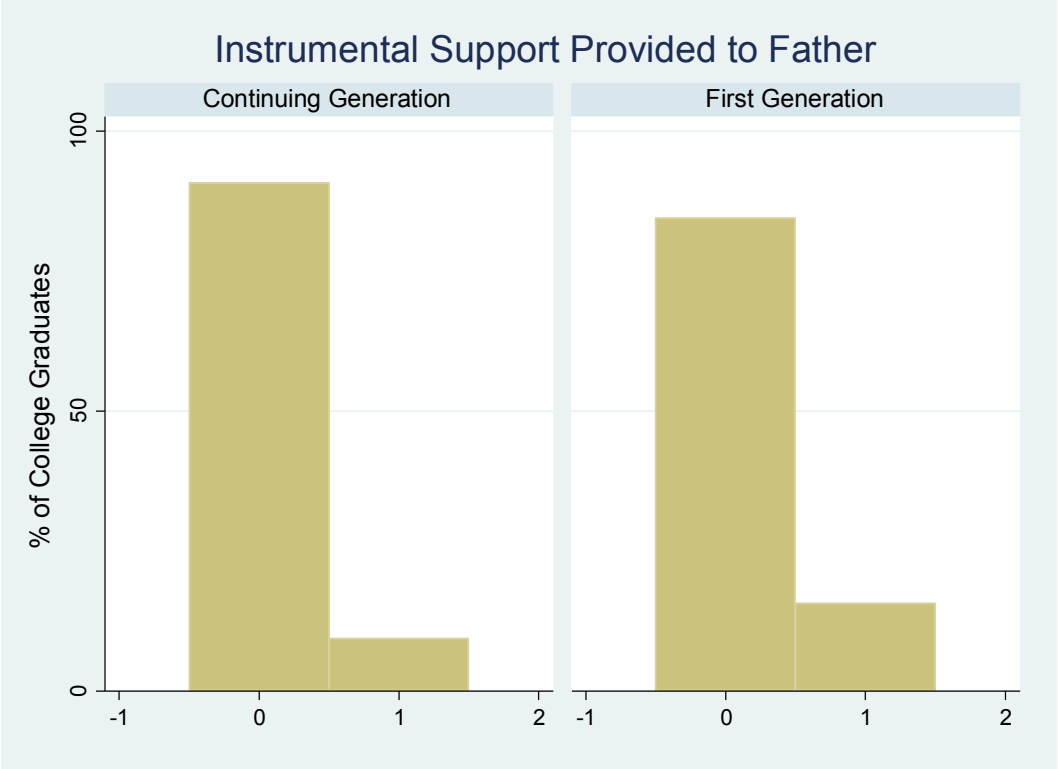
Appendix 7. Mean Stress by College Graduate Status



Appendix 8. Receipt of Instrumental Support by College Graduate Status



Appendix 9. Provision of Instrumental Support to Mother/Mother Figure by College Graduate Status



Appendix 10. Provision of Instrumental Support to Father/Father Figure by College Graduate Status